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VOL-01

PERFORMANCE QUALIFICATION PROTOCOL

FOR

RETAINED SAMPLE ROOM FOR RAW MATERIAL

(LB-025)

OF

UTOPIA PHARMACEUTICALS

10TH OF RAMADAN CITY

CLIENT: UTOPIA — THE LIFE YOU DESERVE

QUALIFICATION PROVIDER: TAG

Package Content:

EGYPT: 26 Al Israa St., Lebanon Sq., Mohandseen, Giza, Egypt
KSA: 3321, Prince Mamdouh Bin Abdulaziz St., Al Sulaymaniyah, Riyadh, KSA
UAE: Sharjah Media City, Sharjah, UAE
www.technoairgate.com
info@technoairgate.com
+201023310801
+966543728852
+971502013049
+20233034440

Table of Content

1. PROTOCOL REVIEW AND APPROVAL

- Prior to the initiation of qualification testing activities, this document will be issued, reviewed and approved by the appropriate personnel.
- The signatures below signify prior approval of the format and content of the final report, ensuring an accurate representation of the qualification activities planned for UTOPIA PHARMACEUTICALS.

TAG Author(s)

Name	Title	Company	Date	Signature
Mohamed Hassan	T.O.T.L.	TAG	01/06/2025	M. Hass

TAG Inspector(s)

Name	Title	Company	Date	Signature
Abdelrahman Attito	P.E.	TAG	01/06/2025	A. Attito

TAG Reviewers(s)

Name	Title	Company	Date	Signature
Noha Essam	SR. T.O.E	TAG	01/06/2025	Noha Essam

TAG Approver(s)

Name	Title	Company	Date	Signature
Ahmed Tarek	T.M.	TAG	01/06/2025	

UTOPIA PHARMACEUTICALS Reviewer(s)

Name	Title	Company	Date	Signature

UTOPIA PHARMACEUTICALS Approver(s)

Name	Title	Company	Date	Signature

Change History

No.	Revision No.	Amended Page No.	Reason for change	Issued Date
1.	00	NA	Original	01/06/2025

Note: Any amendment will be indicated with italic and bold font.

2. INTRODUCION

2.1. Glossary/Abbreviations

- **Performance Qualification (PQ):** The process of obtaining and documenting evidence that the premises, equipment and supporting systems, as connected together, will consistently perform in accordance with the approved process method and specifications. It is the final step of qualification. In this phase, the qualification and validation team verify and document that the user requirements are verified as being met and to ensure that every part of the system will maintain a stable temperature and relative humidity during use.
- **Key operating parameters:** parameters that must be maintained in order to process or produce products with consistent quality attributes and those that may have an impact on the proper operation of the system.
- **Controller:** A device that interprets a mechanical, digital or analogue signal, generated by a sensor, to control an equipment or component.
- **Sensor:** A mechanical device (pressure switch, bimetal temperature switch, etc.), or a digital or analogue transducer (limit switch, pressure sensor, temperature sensor, etc.) that generates a mechanical or electrical signal to an instrument or a controller in order to be interpreted.
- **Electronic data logging monitor (EDLM):** A small portable device that measures and stores temperature and relative humidity readings at predetermined time intervals by means of an electronic sensor. They have programmable alarm capabilities, integrated displays, and can create reports and graphs which may be permanently stored, shared and analyzed via proprietary hardware, software, desktop applications or through hosted databases.
- **TTSPP:** time- and temperature-sensitive pharmaceutical product.
- **Temperature-controlled:** Includes any environment in which the temperature is actively or passively controlled at a level different from that of the surrounding environment within precise pre-defined limits.
- **Mapping:** Documented measurement of the temperature and relative humidity distribution within a storage area, including identification of hot and cold spots.
- **Maximum Temperature/Relative Humidity:** refers to the highest value recorded in the mapped space over the study period, and it may be outside the specified acceptance criteria for the store.
- **Minimum Temperature/Relative Humidity:** refers to the lowest temperature/relative humidity recorded in the mapped space over the study period, and it may be outside the specified acceptance criteria for the system.
- **Mean Kinetic Temperature:** If you have a set of temperature readings across a certain period of time, the Mean Kinetic Temperature across this period means the effective average thermal value for this period. This temperature value is what the stored goods effectively feel during the mentioned time. This is not the arithmetical average of the readings.
- **Hot Spot:** refers to the highest temperature(s) and/or relative humidity(s) recorded in the area studied over the study period, but these highest temperature(s) and/or relative humidity(s) remain within the specified temperature and relative humidity range.

- **Cold Spot:** refers to the lowest temperature(s) and/or relative humidity(s) recorded in space over the study period, but these lowest temperature(s) and/or relative humidity(s) remain within the specified temperature and relative humidity range.
- **Worst Locations:** It refers to hot and cold spots determined in the space over the study period during the thermal qualification study.
  Note: It is also important to look at the overall high and low trends rather than just the highest and lowest temperatures and/or relative humidity. Average values can be useful to help confirm true hot and cold spots.

2.2. Rationale

- The rationale behind this protocol is essential for verifying the thermal performance of the Retained Sample Room located at UTOPIA PHARMACEUTICALS and to confirm that it functions as intended and produces reliable results essential for maintaining product quality and ensuring TTSPPs stored within it are maintained under appropriate conditions. By conducting performance qualification, it becomes possible to identify any deviations from the desired temperature and relative humidity range, reduce risks of product degradation, and maintain quality assurance measures. We aim to minimize the risk of errors or inaccuracies in testing procedures, ensuring that the system operates within specified parameters.
- Performance Qualification Protocol will provide the methodology of qualification studies, formats for recording the observation, Criteria of qualification and a guideline for documentation of the study.

2.3. Protocol Purpose

- To evaluate the heat distribution profiles and trends throughout the Retained Sample Room located at UTOPIA PHARMACEUTICALS.
- To ensure uniformity and compliance with regulatory standards and to verify that the Retained Sample Room meets regulatory requirements for temperature and relative humidity control.
- To identify the scope of qualification required by UTOPIA PHARMACEUTICALS.
- To determine the responsibilities of TAG and UTOPIA PHARMACEUTICALS.
- To clarify the rationale of this work scope and to clarify the rationale behind the chosen study design and its methodology.
- To describe the followed procedure used to study the heat distribution throughout the Retained Sample Room (LB-025) located at UTOPIA PHARMACEUTICALS and to ensure uniformity and compliance with regulatory standards.
- To identify the personnel of charge that will perform and follow-up this scope.

2.4. Protocol Scope

The scope of this protocol covers the performance qualification of the of the Retained Sample Room (LB-025) located at UTOPIA PHARMACEUTICALS for full load cycle for 7 days and performing the power failure test for 30 min and open-door test for 5 min.

2.5. Documents Execution Instructions

Prior to the initiation of Performance Qualification testing activities, this document will be generated, reviewed and approved by the appropriate personnel.

The testing specified in this approved Protocol will be conducted in accordance with the instruction detailed in the test cases.

Additional documentation requirements for protocol and report are as follows:

- Each person recording or reviewing the information in this document must complete the Signature Log
- After completing entries in the test cases, the initials and date of the individual responsible for the entry must be entered in the appropriate column
- Any blank entry space or box must have a line drawn through it, initialed, and dated.
- Any correction entry must be marked with a unique line drawn through the data to be changed, initialed, and dated. After correction, wrong data must remain readable.
- General datasheets and/or supporting documentation must be inserted as near to the related test datasheet as possible and must include the following information:
  - Reference to supplemented datasheet
  - A unique id number (i.e. number of the supplemented datasheet + [a], [b], ... [aa], [ab], etc.
  - Page number
- Supporting documentation not related to a specific datasheet can be attached at the end of this document. Attachments list has to be used to assign a unique id number.
- Attachments are to be intended both as digital/magnetic and paper supported.
- When approved vendor documentation (Protocols) is available and approved by UTOPIA PHARMACEUTICALS, it will be possible to use it for the execution of the Protocol tests at the condition that the documentation meets the minimal requirements listed above.

Any test exception and failure verified during the protocol execution shall be noted on the "Deviation Report" form (Data Sheet Number 01.01.03.01 in Annex 01.01 (PQ Results Data Sheets)). Every exception and its conclusion (intended as foreseen corrective action results) shall be documented inside the related qualification summary.

2.6. Responsibilities

For the submission/approval, execution of this protocol and its final report, the responsibility of all personnel involved with the verification and documentation process are as follows:

2.6.1. COPMANY_NAME

- Provide the necessary information needed for the Performance Qualification Protocol issue.
- Review and approve the protocol for compliance before qualification execution and ensure that the protocol aligns with regulatory requirements and company policies.
- Responsible for the operational aspects of the system being qualified.
- Provides access to the system being qualified, coordinate and assist in addressing any system-related issues that may impact the mapping process.
- Develop the project timeline and oversee the entire thermal qualification project, including planning, coordination, and execution.
- Provides any documents required in the performance qualification test such as layouts.
- Assign tasks to the responsible team members, ensure adherence to the approved protocol, and manage communication with stakeholders.
- Ensure that the thermal qualification process meets regulatory requirements and quality standards.
- Monitor data collection procedures, verify accuracy of results, and assess compliance with industry guidelines.
- Review any deviation in the deviation form, determine the corrective actions, and evaluate results of corrective measures and approve them.
- Review and approve the report and test results for compliance after execution and ensure that the report aligns with regulatory requirements and company policies.

2.6.2. TAG

- Design and prepare the qualification protocol, including all the recommendations and corrections that are required by UTOPIA PHARMACEUTICALS.
- Review and approve the protocol for compliance before qualification execution and ensure that the protocol aligns with regulatory requirements and company policies.
- Execute the qualification only after this protocol has been approved by UTOPIA PHARMACEUTICALS.
- Develop the project timeline and oversee the entire thermal qualification project, including planning, coordination, and execution.
- Assign tasks to the responsible qualified team members, ensure adherence to the approved protocol, and manages communication with stakeholders.
- Assure that any instrument used during qualification has been previously calibrated and that a copy of the calibration certificate is attached.
- Distribute the monitoring devices, ensure data collection at specified interval and troubleshoot any technical issues incident by TAG.
- Conduct and oversee the technical aspects of the thermal qualification study.
- Perform data analysis and interpret results to ensure the accuracy and reliability of the study and compare test results with the acceptance criteria and determine if it conform or not conform.
- Identify temperature/relative humidity trends, generate reports, and communicate findings and any deviations to UTOPIA PHARMACEUTICALS for further action.
- Assure that data from tests, executed by TAG, are properly recorded in an acceptable format on work sheet and on the report.
- Ensure that all original data, final form and tables are signed and dated, that these documents are attached to final Report or that a note with their storing location is specified.
- Ensure that the description of the tool used for tests and/or verifications, its serial number and its ID number are Reported on data collection worksheets and/or forms.
- Prepare the Performance Qualification Report including all the advices and amendments pointed out by UTOPIA PHARMACEUTICALS and submit for it for review and approval by the concerned UTOPIA PHARMACEUTICALS departments.
- Maintain records of protocol, data collection procedures, calibration certificates, and final reports and ensure that all documentation is accurate, organized, and accessible for future reference.

2.7. Signature Log

Each person records, review and approve the information in this document must complete the signature log.

2.8. System Brief Description

The scope of this protocol intends to cover the performance qualification procedure of Retained Sample Room (LB-025) located at UTOPIA PHARMACEUTICALS with the following description:

System Brief Description	
Description	Retained Sample Room for Raw Material
Dimensions/Volume	5.3 m (L) x 5.0 m (W) x 2.7 m (H)
Code	LB-025
Acceptance Criteria	NMT 25 °C, NMT 65 %RH
Location	Raw Material Warehouse
Load Description	Full Load
Key Operating Parameters	Temperature and Relative Humidity

3. PERFORMANCE QUALIFICATION METHODOLOGY

3.1 Pre-Requisties

- Performance Qualification activities will only start after this Protocol is approved by the Officials deputed by UTOPIA PHARMACEUTICALS.
- After this approval, the signed original of the Report will be filed in a suitable archive dedicated to Performance qualification/validation documents while another copy will be made available for working purposes.
- This copy, in which data gathered and recorded during qualification, and to which documents (such as layout, printouts, etc.) are attached, becomes the Qualification Report for the examined system.
- Once Performance Qualification Protocol is completed, any changes shall have to be checked, planned, and approved by UTOPIA PHARMACEUTICALS and mentioned in the change history table.
- Any non-conformities encountered and any other discrepancies from acceptability criteria of this Protocol shall be recorded in the "Deviation Report" attached Data Sheet Number (Data Sheet Number 01.01.03.01 in Annex 01.01 (PQ Results Data Sheets)).

3.2 Key Concepts

- **Mean Kinetic Temperature:**

Mean kinetic temperature (MKT) is defined by the ICH as 'A single derived temperature that, if maintained over a defined period of time, affords the same thermal challenge to a drug substance or drug product as would be experienced over a range of both higher and lower temperatures for an equivalent defined period. The mean kinetic temperature is higher than the arithmetic mean temperature and takes into account the Arrhenius equation.' The Haynes formula can be used to calculate the MKT. It is higher than the arithmetic mean and takes into account the Arrhenius equation from which Haynes derived his formula. Thus, MKT is the single calculated temperature that stimulates the non-isothermal effects of storage temperature variations.

$$T_k = \frac{\Delta H / R}{-\ln \frac{e^{-\Delta H/RT}{}_{(1)} + e^{-\Delta H/RT}{}_{(2)} + \ldots + e^{-\Delta H/RT}{}_{(n)}}{n}}$$

Where:

T_k = MKT in °K
ΔH = Heat of activation/activation energy
R = Universal gas constant (8.3144×10^{-3} kJ.Mole^{-1}. °K^{-1})
T = Temperature in °K
n = Total number of equal time periods over which data are collected

- **The intervention Tests:**

The purpose of the door open and blackout tests in performance qualification is to simulate real-world scenarios that may impact temperature and relative humidity uniformity and stability within a storage environment. These tests help assess the resilience of the temperature and relative humidity control system and the effectiveness of the monitoring system in maintaining the required temperature and relative humidity conditions.

1. **Power Failure (Blackout) and Recovery Test:**

- The blackout test involves simulating a power outage or loss for a defined period. This test evaluates the system's response to sudden temperature and relative humidity fluctuations and its ability to maintain temperatures and/or relative humidity within acceptable limits during an emergency situation. By conducting these tests as part of thermal mapping, organizations can ensure that their storage facilities can withstand potential disruptions and maintain consistent temperature and relative humidity conditions critical for preserving product quality and compliance with regulatory standards.
- When the mapping exercise is in progress, shut-down the power (including HVAC system if any) for a specific period of time and record the shut-down time, then calculate the recovery time (the maximum time after shutting down the power & turning the power on for all data loggers to get back within the acceptance limits).
- Generally, there are no specific acceptance criteria for this test unless a recovery time is specified in the unit's manufacturer's specifications.

2. **Door Opening and Recovery Test:**

- This test evaluates how quickly the system can recover and stabilize temperatures and/or relative humidity after a disruption. This test simulates the impact of routine door openings during operational use and assesses the system's ability to maintain temperature and relative humidity integrity.
- During the mapping exercise open the door of room for a specific period of time and record time then close the door and calculate the recovery time (the maximum time after door opening & closing for data loggers to get back within the acceptance limits).
- The temperature and relative humidity should be maintained within the defined temperature and relative humidity limits except for a maximum of "30 minutes" following the door opening.
- The acceptance criterion for this test is that the temperature and relative humidity recorded by all the EDLMs located inside the storage area should return to being within the specified temperature and relative humidity range within 30 minutes after the door(s) are closed at the end of the door opening test sequence.

3.3 Associated Material and Equipment Description

To ensure that the temperature and relative humidity distribution in the space to be mapped is adequately characterized, we should use a sufficient number of electronic data logging monitors (EDLMs) along with suitable computer equipment and software to store and analyze the data. The selected EDLMs will:

- be technically suitable for the specific mapping task and for the intended operating environment.
- provide a reliable and continuous record of time-temperature and relative humidity data.
- have an appropriate temperature and
- relative humidity range so that all anticipated temperature and relative humidity extremes can be recorded.
- have a user-programmable data sampling period, allowing time intervals to be set in the range from 1 minute to 15 minutes (maximum) and sufficient memory for the intended length of the study and the chosen recording interval.
- have a US National Institute of Standards and Technology (NIST)- traceable 3-point calibration certificate with a guaranteed error of no more than ± 0.5 °C and ± 5 %RH at each calibration point.
- enable the recorded time-temperature and relative humidity data to be downloaded to a computer system for subsequent analysis.
- have data storage and analytical software that complies with applicable regulatory requirements (for example: 21 CFR part 11).

Used Reference Equipment Description						
Description	No. of EDLMs	Location	Accuracy	Manufacturer	Model	Calibration Due Date
Data Logger	27	Inside Retained Sample Room	± 0.5 °C, ± 5 %RH	Will be determined at the execution phase		
Data Logger	1	Outside Retained Sample Room (Ambient)	± 0.5 °C, ± 5 %RH			
The exact location of each data logger in Retained Sample Room is specified in the layout, see point 3.7 in this protocol.						

3.4 Data Loggers Quantity and Distribution Locations Rationale

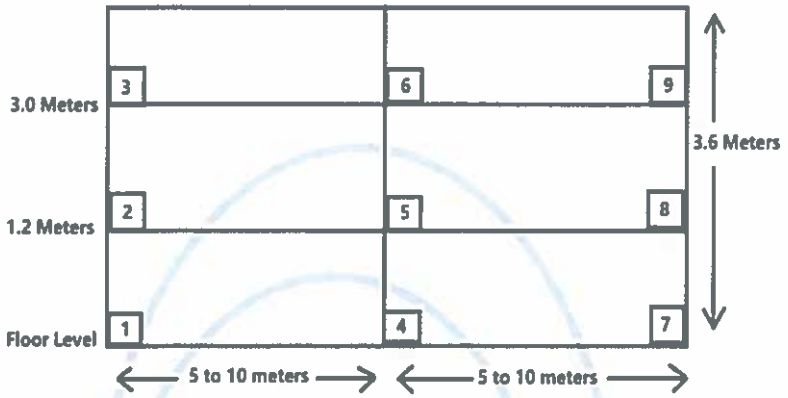
By distributing data loggers at various locations within the Retained Sample Room, we can ensure that temperature and relative humidity remain consistent throughout it, minimizing the risk of temperature and relative humidity differentials that could affect products integrity.

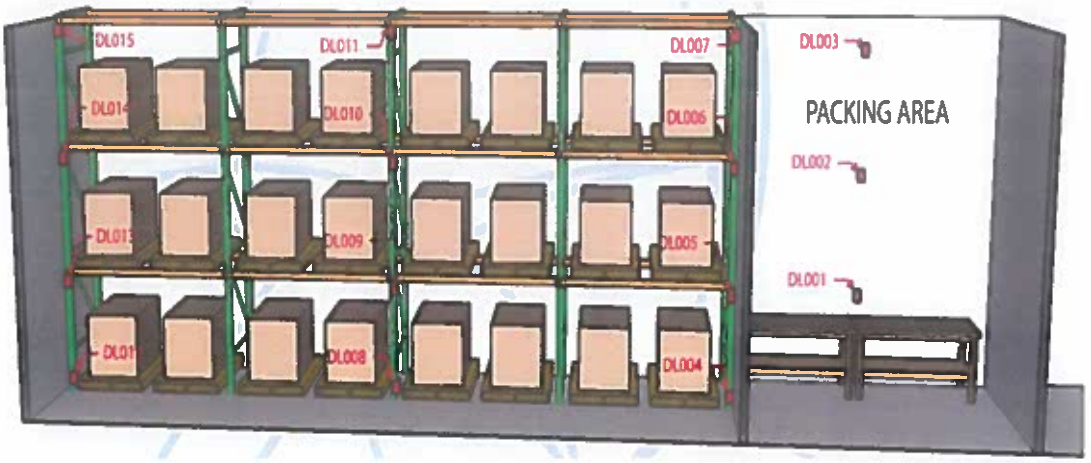
- **Large Facilities/Storage Areas Qualification:**
  As the heat goes up and cold down the data loggers shall be placed on top and bottom of each location. Shelving and pellet storage areas may create 'hot spots' by obstructing air circulation. Due to less circulation of air in corners the data loggers shall be placed near to each corner of rooms. Doors may stay warmer or cooler in response to temperatures and/or relative humidity outside. All the probes shall be distributed uniformly in the Retained Sample Room and should cover all Vertical planes (As illustrated in the below figures).
  - **Ceiling Area:** Monitoring temperature and relative humidity differentials from the ceiling provides insights into air circulation and potential temperature and relative humidity stratification within the room.
  - **Near the Door:** Temperature and relative humidity fluctuations near the door can impact overall room temperature and relative humidity. Placing a data logger here helps assess door seal effectiveness and heat exchange.
  - **Floor Level:** Monitoring temperature and relative humidity at floor level is crucial for assessing uniformity and ensuring stored items are not exposed to extreme temperatures and relative humidity.
  - **Near Cooling Units:** Proximity to cooling units helps evaluate their efficiency and performance, ensuring proper functioning and consistent temperature and relative humidity maintenance.
  - **Remote Corner:** Placing a data logger in a remote corner assesses temperature and relative humidity uniformity across all areas of the room, identifying potential hot or cold spots.
  - **Middle of the Room:** Monitoring the central area provides an overview of the average temperature and relative humidity, aiding in adjusting cooling settings for optimal storage conditions.
  - **Shelving Units:** Data loggers on shelving units monitor temperature and relative humidity variations at different heights, ensuring uniform cooling throughout the storage space.
  - **Behind Obstructions:** Placing a data logger behind obstructions like pallets or boxes helps assess the impact of blockages on airflow and temperature and relative humidity distribution.
  - **Ambient:** Placing a data logger outside the mapped area as external factors can significantly impact the internal environment.

Best Practice as per WHO and ISPE Guidelines

Within the usable volume of the large facilities:
• **Grid Spacing (Length and width):** use an EDLM every 5 to 10 m (or up to 20 to 30 m for large areas).
• **Height:** At each point on the grid, arrange EDLMs vertically as follows:
  ◦ if H ≤ 3.6 m ceiling, distribute EDLMs vertically at floor (low level) , 1.2 m (medium level), and 3.0 m (high level).
  ◦ if H > 3.6 m, distribute EDLMs vertically at the bottom (low level), middle (multiple) and top of the space (high level). For a storage area 6 m in height, EDMLs can be positioned in each grid location heights of 0.3 m, 1.8 m, 3.6 m, and 5.4 m).

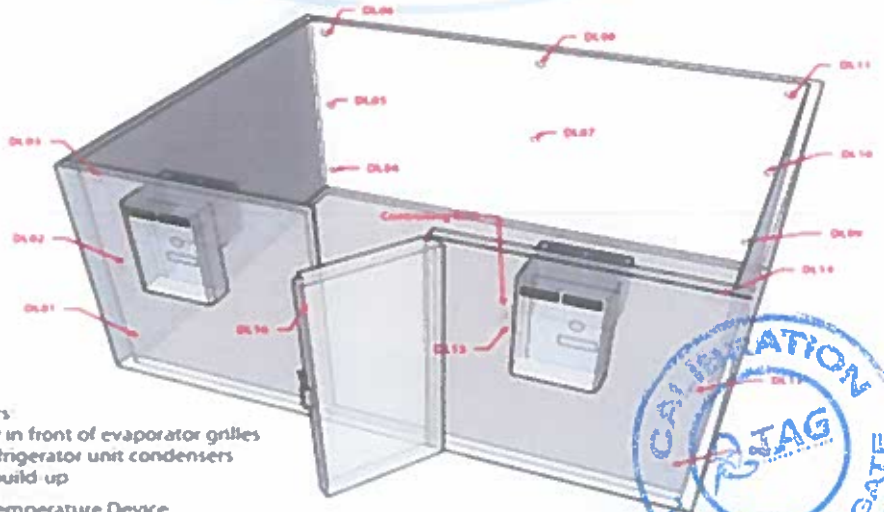
➢ The Following illustration are examples for data-loggers distribution for pallets or shelfs:





➢ The Following illustration are examples for data-loggers distribution for regular rooms:

Typical location of data loggers in a walk-in cold room



Additional sensors
DL17, 18: Directly in front of evaporator grilles
DL19, 20: Near refrigerator unit condensers
to monitor heat build up

RTD: Recording Temperature Device

3.5 Procedure Description

The following steps outline the methodology for conducting the performance qualification study.

Methodology	
Pre-requisite	Steps 1 to 5 must be completed before the mapping protocol can finally be approved.
Step (1)	**Selecting Data Logger:** - The selected data loggers have been previously calibrated (on annual basis) at points covering the study range. For their specification, see point 2.3 in Annex 01.01 (PQ Results Data Sheets) and their calibration certificates are attached in the turn over package (Annex 01.02).
Step (2)	**Designating the Techncial Team:** - See point "5. SIGNATURE LOG" including the list of the team members with their signatures/initials for traceability.
Step (3)	**Determining the system under qualification specifications:** - For Large Facilities/Storage Areas Qualification: Record dimensions, shelving/pallet layouts, and HVAC component locations and include drawings with airflow obstructions.
Step (4)	**Defining Acceptance Criteria:** - Base criteria on product/equipment requirements and/or according to the customer requirement (or omit for exploratory studies).
Step (5)	**Determination of EDLM Locations:** - As explained in point 3.3, we will need 28 EDLMs to perform accurate qualification for this Retained Sample Room.
Step (6)	**Recording EDLM and thermostat Locations:** - The exact location of each data logger in Retained Sample Room is specified in the layout, see point 3.7 in this protocol. - For the table of EDLM locations and the controller set point, see data sheet no. (01.01.01) in Annex 01.01 (PQ Results Data Sheets).
Step (7)	**Labelling and Programming EDLMs:** - Assign unique IDs and record serial numbers of each EDLM. - Program each EDLM with the same sampling interval which should be set between 1 and 15 minutes. Set the same start time for all units. - For the exact study design, see point 2.4 in Annex 01.01 (PQ Results Data Sheets).
Step (8)	**Fixing EDLMs in Position:** - Position and fasten the EDLMs so that they cannot be damaged or displaced during the course of routine operations. - Ensure that sufficient time is allowed for the EDLMs to be conditioned to the ambient temperature before the mapping exercise begins.

Step (9)	**Conducting Mapping Exercise:** - For the exact study design including study period details, see point 2.4 in Annex 01.01 (PQ Results Data Sheets)
Step (10)	**Performing Intervention Tests:** - **Power Failure (Blackout):** For the exact test design see point 2.3 in Annex 01.01 (PQ Results Data Sheets). - **Door Opening:** For the exact test design, see point 2.3 in Annex 01.01 (PQ Results Data Sheets).
Step (11)	**Data Analysis:** - Download the EDLM readings and consolidate the data for the study analysis. - Issue the report and identify the hottest point, coolest point attained and calculation of mean kinetic temperature. - Mark the area of hottest and coldest points. - Review the report and note down the maximum, minimum temperature and Relative Humidity reached during the interventions (power failure, door opening) and the time required to regain the temperature and/or Relative Humidity.

3.6 Study Design

Heat Distribution Study Design

Controller Setting: @ °C (will be determined at the execution phase) and RH% controlled with Heaters.

Acceptance Criteria: NMT 25 °C, NMT 65 %RH

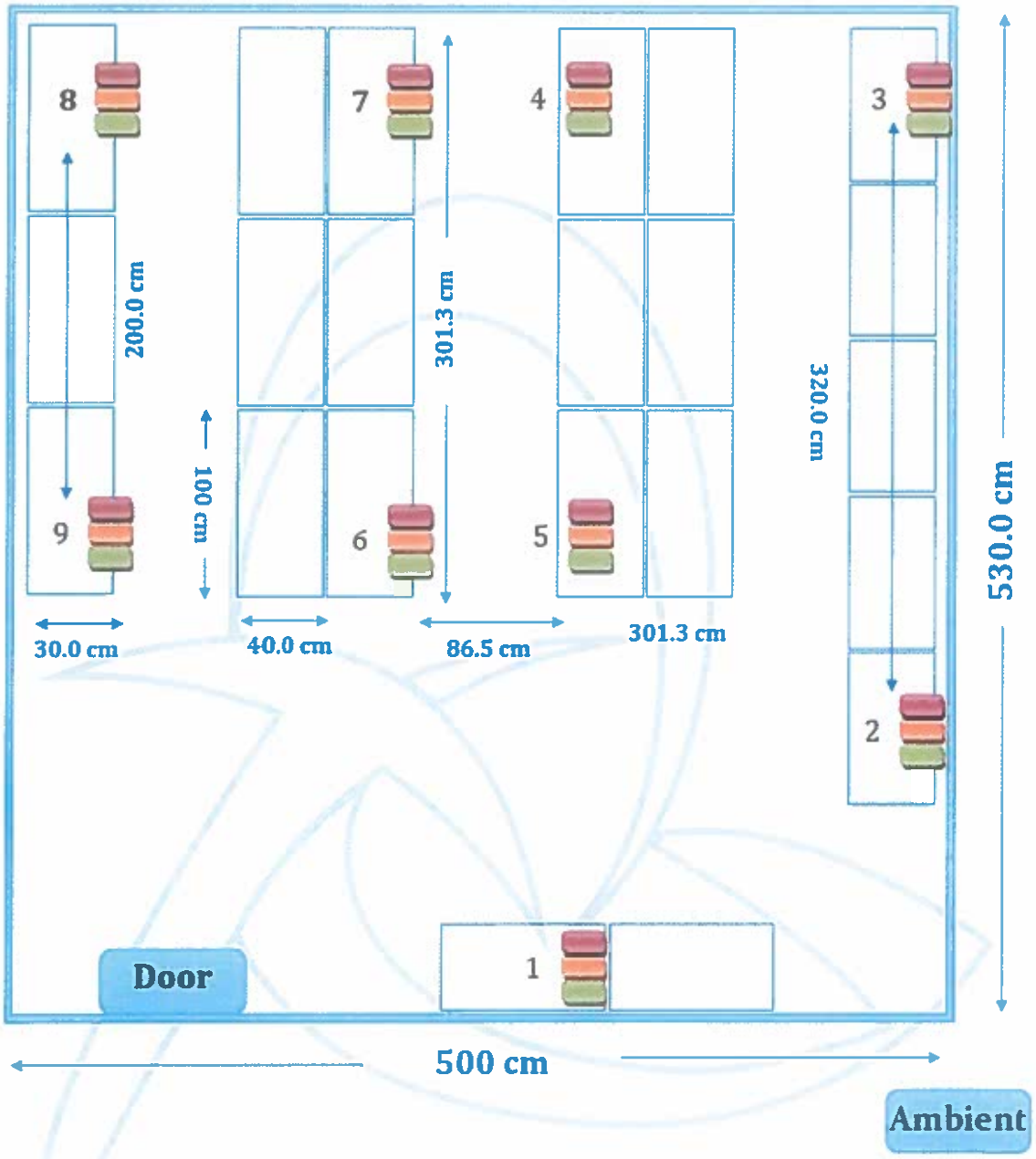
Cycle No.	Load Description	Start Date	Stop Date	Sampling Period	Sample Frequency
1.	Full Load (Packaging material: 9 Columns (of the 9 racks with 5 shelves) & (the 3 columns of the 2 racks with 6 shelves). Raw materials: 10 Columns of the 9 racks with 5 shelves are filled with 128 bottle/shelf. 10 (columns) * 5 (shelves) * 128 = 6400 bottles)	dd/mm/yyyy hr:min AM/PM	dd/mm/yyyy hr:min AM/PM	24 hrs.	2 minutes

intervention Tests Study Design

Test No.	Test Description	Start Date	Stop Date	Test Period	Sample Frequency
1.	Power Failure (Blackout)	dd/mm/yyyy hr:min AM/PM	dd/mm/yyyy hr:min AM/PM	30 minutes	2 minutes
2.	Door Opening	dd/mm/yyyy hr:min AM/PM	dd/mm/yyyy hr:min AM/PM	5 minutes	2 minutes

3.7 Endorsed Layout and Data Loggers' Distribution

Location No.		Rack No.	Level	Serial number
1	1	C1A	H	will be determined at the execution phase
2		C3A	M	will be determined at the execution phase
3		C5A	L	will be determined at the execution phase
4	2	A1A	H	will be determined at the execution phase
5		A3A	M	will be determined at the execution phase
6		A5A	L	will be determined at the execution phase
7	3	B1C	H	will be determined at the execution phase
8		B3C	M	will be determined at the execution phase
9		B5C	L	will be determined at the execution phase
10	4	D1B	H	will be determined at the execution phase
11		D3B	M	will be determined at the execution phase
12		D5B	L	will be determined at the execution phase
13	5	E1A	H	will be determined at the execution phase
14		E3A	M	will be determined at the execution phase
15		E5A	L	will be determined at the execution phase
16	6	E1B	H	will be determined at the execution phase
17		E3B	M	will be determined at the execution phase
18		E5B	L	will be determined at the execution phase
19	7	H1A	H	will be determined at the execution phase
20		H3A	M	will be determined at the execution phase
21		H5A	L	will be determined at the execution phase
22	8	G1C	H	will be determined at the execution phase
23		G4C	M	will be determined at the execution phase
24		G6C	L	will be determined at the execution phase
25	9	G1A	H	will be determined at the execution phase
26		G4A	M	will be determined at the execution phase
27		G6A	L	will be determined at the execution phase
28	Ambient			will be determined at the execution phase



AHU	Controller Setting	
	(°C)	%RH
QC-AHU-02	(will be determined at the execution phase)	Heaters

- Dimensions of the retained sample room is 530 cm (L) x 500 cm (W) x 270 cm (H).
- At Length: The distance between every dataloggers at right side is 320.0 cm.
- At width: The distance between every dataloggers at right side is 200.0 cm.

High Level at shelf 2 and 1 (80 cm from Medium Level).
Medium Level at shelf 4 and 3 (80 cm from Ground).
Low Level at shelf 6 and 5 (Ground Level).

CALIBRATION TAG TECHNO AIR GATE

3.8 Acceptance Criteria

The general acceptance criteria for PQ stage specify that the results of all the locations envisaged in this Protocol, when correctly run and documented in the attached forms, confirm the expected result.

3.9 Results Evaluation

After conducting the performance qualification study, the results will be thoroughly evaluated to assess temperature and relative humidity distribution, uniformity, and stability within the storage environment. Key aspects to consider in the final report after the evaluation include:

- Comparison of measured temperatures and/or relative humidity against set criteria and industry standards.
- Analysis of data trends and patterns to understand the overall thermal performance of the facility.
- Identification of temperature and relative humidity variations, and hot/cold spots would be identified for future monitoring.

3.10 Deviation Report

Any observed deviations from acceptance criteria encountered while running the performance qualification shall be recorded in the specific form named "Deviation Report" enclosed in (Data Sheet Number 01.01.03.01 in Annex 01.01 (PQ Results Data Sheets)) to be reported to UTOPIA PHARMACEUTICALS for taking and following up the corrective actions for those deviations.

3.11 Conclusion and Recommendations

- Based on the results of the performance qualification study, a conclusion will be drawn regarding the effectiveness of the temperature and relative humidity control system and the overall thermal stability of the system. The conclusion will summarize the key findings of the study and address whether the system meets the required temperature and relative humidity specifications for intended use.
- Following the evaluation and conclusion of the thermal mapping study, recommendations will be provided to improve temperature and relative humidity management and enhance the overall efficiency of the system. By incorporating the following recommendations, organizations can optimize temperature and relative humidity control, mitigate risks of product degradation, and ensure compliance with regulatory requirements. These recommendations may include:
  - Implementing adjustments to the temperature and relative humidity control system to address identified hot/cold spots.
  - Upgrading controlling systems to improve temperature and relative humidity stability.
  - Enhancing monitoring and alarm systems for better temperature and relative humidity control.
  - Establishing protocols for door opening/closing procedures to minimize temperature and relative humidity fluctuations.
  - Conducting regular maintenance and calibration of temperature and relative humidity monitoring devices.

3.12 Final Performance Qualification Report

After all the studies envisaged in this Performance Qualification Protocol, a Final Performance Qualification Report shall be issued. This Report consists of multiple sections.

In the first section, the results of all the studies run during Performance Qualification stage shall be recorded in the proper table.

The next section provides a table where deviations encountered, if any, shall be recorded, also specifying its description and the deviation closing date.

The last section consists of one page and shall attest revision and approval of all results obtained by appointed Officials.

When all tests are performed and deviations are closed, the Report will be finally approved by the appointed Officials.

3.13 Re-Validation and Management of Changes/Modifications

- Any major changes/modifications made to the system after its qualification shall be recorded in "Change Control" procedure of UTOPIA PHARMACEUTICALS.
- Each significant change or modification made to the system after this Protocol has been tested requires that the need to re-submit the system to another Re-Qualification procedure is evaluated. Reasons shall be given for not proceeding to a new Re-Qualification.
- For storage areas, if they are affected by seasonal temperature variations, at least two temperature mapping studies may need to be carried out in each area in order to observe the effect of seasonal variation. Typically, one should be carried out during the warmest season and one during the coldest season because this will represent the worst-case scenario. This will establish whether the mapped area is able to maintain stable temperatures throughout the year. Typically, two season mapping is not necessary for cold rooms and freezer rooms.

4. REFERENCES

(1) WHO "Annex 9: Model guidance for the storage and transport of time and temperature-sensitive pharmaceutical products" Technical Supplement 6, May 2015.

(2) WHO "Annex 9: Model guidance for the storage and transport of time and temperature-sensitive pharmaceutical products" Technical Supplement 7, May 2015.

(3) WHO "Annex 9: Model guidance for the storage and transport of time and temperature-sensitive pharmaceutical products" Technical Supplement 8, May 2015.

(4) Health Products Regulatory Authority (HPRA): Guide to Control and Monitoring of Storage and Transportation Temperature Conditions for Medicinal Products and Active Substances

(5) 21CFR 211.142 and 211.150: Storage and Distribution.

5. SIGNATURE LOG

Printed Name	Title	Company / Department	Initials	Signature
Mohamed Hassan	Technical Office Team Leader	TAG	M.H	M. Hass
Abdelrahman Attito	Site Engineer	TAG	A.A	A. Attito
Noha Essam	Technical Office Senior	TAG	N.E	Noha Essam
Ahmed Tarek	Technical Manager	TAG	A.T	