



**TEMPERATURE MAPPING PROTOCOL FOR UNDER TEST AND APPROVED RM STORE
AREA**

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1.0 PROTOCOL APPROVAL:

Signing of this approval page of Protocol indicates agreement with the validation approach described in this document. If modification to the validation approach becomes necessary, an addendum shall be prepared and approved. The protocol cannot be used for execution unless approved by the following authorities.

This protocol of Temperature/Humidity mapping has been reviewed and approved by the following persons:

FUNCTION	NAME	DESIGNATION	DEPARTMENT	SIGNATURE	DATE
PREPARED BY			QUALITY ASSURANCE		
REVIEWED BY			QUALITY ASSURANCE		
			ENGINEERING		
APPROVED BY			STORE		
			HEAD OPERATION		
			QUALITY ASSURANCE		



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2.0 OVERVIEW:

2.1 Objective:

The objective of this protocol is to develop a plan for monitoring of temperature and humidity of Under Test & Approved RM Store Area and to identify the minimum and maximum temperature and humidity observed and also to identify the location for monitoring of temperature/humidity on daily basis where the more fluctuation observed and also to demonstrate the reproducibility of the temperature humidity in the area. The mapping shall be performed in line of WHO TRS 961.

2.2 Purpose:

The purpose of this protocol is to establish documentary evidence to ensure that the temperature humidity inside the Under Test & Approved RM Store Area maintained & is suitable for storing the Raw materials.

2.3 Scope:

The protocol describes the procedure, documentation, acceptance criteria & revalidation criteria to be used. This protocol shall be used for the mapping of Under Test & Approved RM Store Area.

2.4 Responsibility:

In accordance with protocol, following functions shall be responsible for the Temperature humidity mapping of the Under Test & Approved RM Store area.

Execution Team (Comprising members from Production, Engineering and Quality Assurance) and their responsibilities are following:

- Prepares the temperature/humidity mapping protocol.
- Ensures that the protocol is in compliance with current policies and procedures on system validation.
- Distributes the finalized protocol for review and approval signatures.
- Execution of protocol.
- Review of protocol, the completed data package and the final report.
- The data logger/sensor shall be placed by the Engineering Persons



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- The printout of temperature/humidity mapping data shall be reviewed by production, engineering and QA person.
- In case of any failure of Temperature/Humidity observed the production person shall inform to engineering and QA and engineering persons shall take corrective action.

Head – production/ Engineering:

- Review of protocol, the completed data package and the final report.
- Assist in the resolution of validation deficiencies.

Head – Operation / Quality Assurance:

- Review and Approval of protocol, the completed qualification data package and the final report.



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2.6 Risk analysis:

The Under Test & Approved RM Store Area was created for storing of the Raw material awaited for next processing step. The product is not exposed in this area. As such the risk to product is low and if unfortunately temperature/humidity is out of limit for longer time during storage may lead to product abnormality. The risk analysis shall be carried out in line with HACCP tool as per the manual.

The risk hazard analysis and control point identified as per Annexure I.

The risk evaluation has been done as per Annexure II.

Conclusion of risk analysis:

All the risk related to Under Test & Approved RM Store Area temperature and humidity mapping and excursion evaluated by HACCP tool (Hazard analysis and critical control point) and has been concluded that the risk which is identified during analysis are found high but adequate control point in place.

3.0 PREREQUISITES:

- Calibrated data logger and sensors or wireless data logger.
- All Standard Operating Procedure shall be verified if any.
- All the measuring parameters shall be verified.

4.0 ACCEPTANCE CRITERIA:

The temperature and humidity in the room should be maintained throughout activity and should be in between temperature $22 \pm 3^{\circ}\text{C}$ and humidity 40 - 60 %.

5.0 REVALIDATION CRITERIA:

- Change/Modification in Under Test & Approved RM Store area
- Change in storage condition.
- Change/Modification in HVAC system.



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6.0 TEMPERATURE MAPPING PROCEDURE:

- AHU shall be in running condition upto the end of study and operate the HVAC system to get the Temperature 22 ± 3 °C and humidity 40 - 60 % in the area.
- Calibrated wireless data logger/sensor shall be used for temperature/humidity mapping process.
- The total area of Under Test & Approved RM Store Area is 766.224 m². Under Test & Approved RM Store Area shall be divided in equal squares of 5 meter. At least one probe shall be kept in each square identifying the critical spot. Reason for identifying the location shall be recorded. Place 31 numbers of temperature/humidity data logger/sensor in room as per attached drawing and Table no. 08. As per 5 meter criteria only 31 data logger is required hence 31 data logger is considered for temperature mapping.
- Data logger/sensor shall be placed within 5 meter of the area in the respective room.
- Risk analysis shall be performed for the number of sensor selected and placement of the sensor.
- The temperature/humidity of data logger/sensor shall be placed at different working heights and at different locations so as to get the data of actual temperature / humidity maintained throughout the room. The data logger shall be placed in such a way that, the highest, lowest, middle stacking height shall be covered.
- Switch on the data logger and check the working of Data logger.
- Set the print interval time of mapping data i.e. 05 minutes.
- Start the mapping and check the data logger/sensor reading on daily basis twice in a day frequency and same shall be recorded for continues Seven days and record the observation in Annexure III.
- If the temperature is beyond the acceptance limit, immediately rectify the situation and record in discrepancy section and take corrective action.
- At the end of the study remove the data logger and note down the data logger ID from where data logger removed in section No. 09.
- Stop the mapping on data logger and capture the data from data logger and identify the following details.



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- Note down the minimum, maximum and mean temperature/humidity.
- Decision to put the digital hygrometer for routine monitoring shall be taken on the location where maximum fluctuation observed in room & hot Zone.
- Finally observed location shall be taken for the routine monitoring on the basis of temperature mapping study and marking is to be done for identified location observed in room.

7.0 DIAGRAM OF AREA SHOWING THE LOCATIONS:

The diagram of the location of temperature/humidity mapping in the area.

8.0 DATA LOGGER / SENSOR LOCATION NUMBER AND NAME

Area name	Location No.	Location name	Location height from the floor (in mm)
Under Test & Approved RM Store area	T1	Right side of entry door top of rack (A)	6200
	T2	Right side of entry door middle of rack (A)	3000
	T3	Right side of entry door bottom of rack (A)	800
	T4	Right side of entry door top of rack (A)	5500
	T5	Right side of entry door bottom of rack (B)	600
	T6	Right side of entry door Top of rack (B)	6000
	T7	Right side of entry door middle of rack (B)	2800
	T8	Right side of entry door bottom of rack (B)	700
	T9	Right side of entry door middle of rack (C)	2500
	T10	Right side of entry door Top of rack (C)	6100
	T11	Above the door of entry	1800
	T12	Above the door of entry(ladder to ground floor)	3500
	T13	Right side of entry door middle of rack (C)	1800
	T14	Right side of entry door bottom of rack (D)	500
	T15	Right side of entry door middle of rack (D)	2500
	T16	Right side of entry door Top of rack (D)	4000
	T17	Right side of entry door middle of rack (E)	2000
	T18	Right side of entry door Top of rack (E)	6000



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Under Test & Approved RM Store area	T19	Right side of entry door bottom of rack (E)	1500
	T20	Left side of entry door Top of rack (F)	6400
	T21	Left side of entry door middle of rack (F)	2000
	T22	Left side of entry door bottom of rack (F)	400
	T23	Left side of entry door Bottom of rack (G)	800
	T24	Left side of entry door middle of rack (G)	3200
	T25	Left side of entry door Top of rack (G)	5200
	T26	Left side of entry door middle of rack (H)	1600
	T27	Left side of entry door Top of rack (H)	6500
	T28	Left side of entry door bottom of rack (H)	300
	T29	Left side of entry door Top of rack (I)	5800
	T30	Left side of entry door Bottom of rack (I)	400
	T31	Left side of entry door middle of rack (I)	2700



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9.0 Test Instrument Calibration Details:

Location No. / Name	Channel number	Instrument ID No. (Before mapping)	Calibration Detail			Instrument ID (After Mapping)
			Calibration Done on	Calibration due on	Checked By sign / Date	
T1						
T2						
T3						
T4						
T5						
T6						
T7						
T8						
T9						
T10						
T11						
T12						
T13						
T14						
T15						
T16						
T17						
T18						
T19						
T20						
T21						
T22						
T23						
T24						
T25						



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Location No. / Name	Channel number	Instrument ID No. (Before mapping)	Calibration Detail			Instrument ID (After Mapping)
			Calibration Done on	Calibration due on	Checked By sign / Date	
T26						
T27						
T28						
T29						
T30						
T31						
Data logger	NA					

Remarks: (If Any)

Reviewed By / Date:



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12.0 ABBREVIATIONS SHEET:

Following Abbreviations are used in the Temperature mapping protocol of Under Test and Approved RM Store Area

SR. No.	ABBREVIATION	DESCRIPTION
1.	Sr.	Serial
2.	QAD	Quality Assurance Department
3.	MIS	Miscellaneous
4.	No.	Number
5.	°C	Degree Centigrade
6.	% RH	Relative humidity
7.	HVAC	Heating ventilation and Air Conditioning
8.	i.e.	That is
9.	T	Temperature
10.	I.D.	Identity
11.	QA	Quality Assurance
12.	RM	Raw material



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14.0 FINAL REPORT APPROVAL:

It has been verified that mapping required for Under Test & Approved RM Store Area has been completed as per the predefined protocol. The data required for this protocol completion has been attached to this protocol or included in the qualification summary report. Verified that all amendments and discrepancies are documented, approved and attached to this protocol.

Signature in the block below indicates that all items in this mapping report of Under Test & Approved RM Store Area has been reviewed and found to be acceptable and that all variations or discrepancies have been satisfactorily resolved.

FUNCTION	NAME	DESIGNATION	DEPARTMENT	SIGNATURE	DATE
REVIEWED BY			QUALITY ASSURANCE		
			ENGINEERING		
			STORE		
APPROVED BY			HEAD OPERATION		
			QUALITY ASSURANCE		



TEMPERATURE MAPPING PROTOCOL FOR UNDER TEST AND APPROVED RM STORE AREA

Annexure I

HAZARD ANALYSIS AND CRITICAL CONTROL PARAMETERS

Sr. No	PROCESS STEP	HAZARD	RISK	CRITICAL LIMIT/FREQUENCY	JUSTIFICATION	CORRECTIVE AND PREVENTIVE ACTION	ESTABLISHMENT OF VERIFICATION
1	Under test & approved raw material store area	If temperature does not maintained in the area there is a possibilities of degradation of product and hazard to the patient.	Low	Specified limit is $22 \pm 3^{\circ} \text{c} / 40-60$ %.The frequency of monitoring during mapping is 5 minutes for continuous Seven days. Routine monitoring shall be performed at twice in a day frequency at the position where fluctuation is more.	The temperature mapping is carried out to check the temperature accuracy/distribution avoid the degradation of the product.	Personal entering into Under test & approved raw material store area are well trained in GMP practices.	SOP of temperature monitoring is in place. Protocol based study for temperature mapping is done.
2	Man and material movement	Possibilities of excursion in temperature may be observed which may lead to the abnormality of product stored.	High	Specified limit is $22 \pm 3^{\circ} \text{c} / 40-60$ %.The temperature mapping is performed for seven consecutive days with temperature logging at 5 minutes frequency.	Effect of routine operations done in the area with normal man and material movement shall be evaluated by using online data logging system during mapping and same shall be verified during routine monitoring. Door closure is available.	Personal entering into Filled bin hold area, are well trained in GMP practices. Training to be given for entry exit to new employee.	SOP is in place for entry and exit to Under test & approved raw material store area, Door closure is available.
3	Door opening and closing	Possibilities of excursion in temperature may be observed which may lead to the abnormality of product stored.	High	Specified limit is $22 \pm 3^{\circ} \text{c} / 40-60$ %.The temperature mapping is performed for Seven consecutive days with temperature logging at 5 minutes frequency.	Effect of routine operations done in the area with normal man and material movement shall be evaluated by using online data logging system during mapping and same shall be verified during routine monitoring. Door closure is available.	Personal entering into dispensed material hold area, are well trained in GMP practices. Training to be given for entry exit to new employee.	SOP is in place for entry and exit to Under test & approved raw material store area. Door closure is available.
4	Breakdown of HVAC	Breakdown of HVAC may have direct impact on the temperature and may not be maintained in the area which may lead to product abnormality.	High	Specified limit is $22 \pm 3^{\circ} \text{c} / 40-60$ %The temperature monitoring is performed at twice in a day frequency. The temperature mapping is performed for Seven consecutive days with temperature logging at 5 minutes frequency.	In case of failure of HVAC due to continues running temperature may increase.	The preventive maintenance for HVAC system shall be done for proper functioning to be maintained. The Diesel generator is provided if power failure occurred.	Routine monitoring shall be carried out twice in day. SOP for preventive maintenance is in place.



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Annexure I

HAZARD ANALYSIS AND CRITICAL CONTROL PARAMETERS

Sr. No	PROCESS STEP	HAZARD	RISK	CRITICAL LIMIT/FREQUENCY	JUSTIFICATION	CORRECTIVE AND PREVENTIVE ACTION	ESTABLISHMENT OF VERIFICATION
5	Sensor location selection during mapping	Wrong selection of sensor location would lead to faulty temperature mapping result which would not be the representative of the area.	High	Specified limit is $22 \pm 3^{\circ} \text{c} / 40-60\%$. The frequency of monitoring during mapping is 5 minutes for consecutive Seven days and routine monitoring shall be performed with twice in day.	The room shall be equally divided within 5 m area and 8 number sensors shall be placed in the area at different height (minimum and maximum covering door opening, middle of the room and corners.	Correct placement of temperature sensors would give the temperature mapping data which would be the representative of the room	Approved protocol of temperature mapping and drawing shall be prepared prior to putting the sensor on location and put the sensor as per the drawing.
6	Faulty sensor/ Wrong sensor/ Faulty data logger	Faulty sensor may gives the faulty result	High	Specified limit is $22 \pm 3^{\circ} \text{c} / 40-60\%$. The calibration of the data logger shall be verified before start of the activity.	Before start of the activity the calibration of data logger shall be verified.	The calibration of sensor and data logger shall be carried out as per predefined frequency	The calibration of SOP is in place for sensors and data logger.
7	Sensor hanging in middle	If wrong selection of sensor location then the result will not be representative the actual status Under test & approved raw material store area.	Low	Specified limit is $22 \pm 3^{\circ} \text{c} / 40-60\%$. The frequency of monitoring during mapping is 5 minutes for continues Seven days.	The data logger shall be hanged in middle which select because the material is kept in middle and which represent result of all area.	Correct placement of temperature sensors in the middle of the room would give the temperature mapping data which would be the representative of the room.	Sensor location diagram temperature mapping is in place and location is marked on the drawing.
8	Near door	If wrong selection of data logger location then the result will not be representative the actual status of Under test & approved raw material store area	High	Specified limit is $22 \pm 3^{\circ} \text{c} / 40-60\%$. The frequency of monitoring during mapping is 5 minutes for consecutive Seven days.	The data logger shall be hanged near door which has been selected because door opening and closing possibilities temperature increases into room and maximum temperature is observed at door location	Correct placement of temperature sensors near the door would give the temperature mapping data which would be the representative of the area.	Sensor location diagram temperature mapping is in place and location is marked on the drawing.
9	All wall / racks of Under test & approved raw material store area	If wrong selection of data logger location then the result will not be representative the actual status of under test & approved raw material store area	Low	Specified limit is $22 \pm 3^{\circ} \text{c} / 40-60\%$. The frequency of monitoring during mapping is 5 minutes for consecutive Seven days.	This location is selected at specified height and on the wall / inside the racks so the sensor shall represent the condition of the room at different location with different height.	Correct placement of temperature sensors at right and left side wall / racks of entry would give the temperature mapping data which would be the representative of the area.	Sensor location diagram temperature mapping is in place and location is marked on the drawing.



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Annexure II

RISK EVALUATION FOR HAZARD IDENTIFICATION

PROCESS STEP	Occurrence (O)	Justification	Severity (S)	Justification	Risk matrix (O X S)	Risk	Action plan
Under test & approved raw material store area	2	SOP of temperature monitoring is in place. Protocol of temperature mapping is in place.	2	The temperature mapping is carried out to check the temperature accuracy/distribution avoid the degradation of the product.	4	Low	Adequate measures are available to identify the critical control parameters in the system.
Man and material movement	5	Man and material movement is occurred for transfer of the material for several time during the day activity hence the occurrence almost certain	1	The temperature mapping is carried out to check the temperature accuracy/distribution with various in operation condition avoid the degradation of the product. Door closure is available.	5	Low	Adequate measures are available to identify the critical control parameters in the system. Door closure is available.
Door opening and closing	5	Door opening occurs several times for transfer of the material.	1	Effect of routine operations done in the area with normal man and material movement shall be evaluated by using online data logging system during mapping and same shall be verified during routine monitoring. Door closure is available.	5	Low	Automatic door closing system is in place. Control measures are adequate for monitoring of temperature at daily basis twice in day which easily identify the excursion of temperature. Door closure is available.
Breakdown of HVAC	1	HVAC system has been installed to control the temperature and relative humidity and also preventive maintenance is in place.	4	All ready HVAC connection has been provided in area to maintain the desired temperature condition;	4	Low	In dispensed material hold area HVAC system has been provided and additional preventive maintaince shall be in a place.
Selection of Sensor location during mapping	1	The area is divided into equally and sensor shall be placed at different location with at different height	4	Wrong selection of location may not provide actual status of all area.	4	Low	Proper distribution of sensor for temperature mapping shall be verified as per the diagram.
If Faulty sensor/ Wrong sensor/ Faulty data logger	1	The activity shall be carried out by approved external vendor with calibrated data logger.	4	Faulty data and wrong representation of area shall be given by data logger.	4	Low	Prior to start the activity calibration and working of data logger shall be verified.



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Annexure III

S.No.	Date	Morning								Verified by	Evening								Verifi ed by
Location No.		T1	T2	T3	T4	T5	T6	T7	T8	NA	T1	T2	T3	T4	T5	T6	T7	T8	NA
Data logger Code No./Channel No.																			
9.																			
10.																			

*Physical verification means position of data logger at right position, data logger location & display screen working. Put “√” if found satisfactory & “X” if not satisfactory

Remark:

Verified By Sign/Date: