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Prequalification Unit Inspection services
WHO PUBLIC INSPECTION REPORT
(WHOPIR)
Finished Product Manufacturer

Part 1	**General information**
Manufacturers details	
Name of manufacturer	**Universal Corporation Limited (UCL)**
Corporate address of manufacturer	Strides Pharma Science Ltd Bilekahalli, Bannerghatta Road, Bangalore-560 076, India
Inspected site	
Name & address of inspected manufacturing site if different from that given above	Club Road, Past Kikuyu Post Office P.O. BOX 1748-00902, Kikuyu town Kikuyu, Kenya 1°14’ 26.64’’S, 36°39’38.83’’E
Unit / block / workshop number	N/A
Inspection details	
Dates of inspection	14-17 March 2023
Type of inspection	For cause. Investigation of complaints handling relating to Tenofovir 300mg/ Lamivudine 300 mg/Dolutegravir 50 mg film-coated tablets (TLD) An email correspondence was received on 25 November 2022 from Universal Corporation Ltd (UCL), regarding complaints reported by the Pharmacy & Poisons Board of Kenya (PPB), for bottles of the above-mentioned product manufactured at (UCL). The product defects included discolored induction seal, black spots on tablets and broken or chipped tablets
Introduction	
Brief description of the manufacturing activities	The company is authorized by the Pharmacy & Poisons Board, Kenya to manufacture tablets, hard gelatin capsules, liquids, dry syrups, powders, and semisolids for human use. Manufacturing activities for all dosage forms take place in the same building. No hazardous products are manufactured on site. Some Quality control activities and tests may be outsourced at approved laboratories.
General information about the	Universal Corporation Limited (UCL) is a subsidiary of Strides Pharma. The manufacturing site is located at Kikuyu Town, 21Km from Nairobi and 37Km from Jomo Kenyatta International Airport. The facilities

company and site	cover an area of approximately 7,600m^2. The site started its operation in 2004. Manufacturing facilities were expanded during 2009-2010 (granulation, dispensing and storage areas). The first product was approved by WHO PQ in 2013. In 2016 Universal merged with Strides Pharma Care Limited.
History	This was the eighth WHO inspection. The last WHO inspection was carried out during 11-14 October 2021. The site is periodically inspected by the Pharmacy & Poisons Board, Kenya.
Brief report of inspection activities undertaken – Scope and limitations	
Areas inspected	The inspection focused on the investigation and actions following receipt of complaints relating to - Tenofovir 300mg/Lamivudine 300 mg/Dolutegravir 50 mg tablets. In addition, the following documents and procedures were reviewed: • Organization Chart • Job descriptions for key personnel • Personnel training and hygiene • Product Quality Review • Quality Risk Management • Responsibilities of the quality units and production • Complaints and Recalls • Deviation control and change control • CAPA • OOS and investigation • Material release • Self-inspection and vendor qualification • Validation and qualification • Technology Transfer – Method Transfer • Equipment calibration • Data integrity • Sampling and testing of materials • Batch processing records • Materials management system • HVAC system • PW system Areas visited: • Starting materials, packaging materials and FPP warehouses • Tablet manufacturing operations • QC laboratories including chemical and microbiological
Restrictions	The inspection was restricted to products approved by WHO PQ and

	UNICEF.
Out of scope	All other products and workshops were outside of the inspection scope and were not visited.
WHO products covered by the inspection	Efavirenz tabs film-coated 600mg Lamivudine/Zidovudine tabs film-coated 150mg/300mg Dolutegravir (Sodium)/Lamivudine/Tenofovir disoproxil fumarate tabs Film-coated 50mg/300mg/300mg Artemether/Lumefantrine tabs 20/120mg Artemether/Lumefantrine Tablet, Dispersible 20mg/120mg Artemether/Lumefantrine Tablet 80mg/480mg Pyrimethamine/Sulfadoxine tab, dispersible 12.50mg/250mg Pyrimethamine/Sulfadoxine tab, dispersible 25mg/500mg Pyrimethamine/Sulfadoxine + Amodiaquine (hydrochloride) tab, dispersible 25mg/500mg + 150mg Pyrimethamine/Sulfadoxine + Amodiaquine (hydrochloride) Tablet, Dispersible 12.5mg/250mg + 75mg
Abbreviations	**Meaning**
AHU	Air handling unit
ALCOA	Attributable, legible, contemporaneous, original and accurate
API	Active pharmaceutical ingredient
APR	Annual product review
APS	Aseptic process simulation
BMR	Batch manufacturing record
BPR	Batch production record
CC	Change control
CFU	Colony-forming unit
CIP	Cleaning in place
CoA	Certificate of analysis
CpK	Process capability
DQ	Design qualification
EDI	Electrdeionization
EM	Environmental monitoring
FMEA	Failure modes and effects analysis
FPP	Finished pharmaceutical product
FTA	Fault tree analysis
GMP	Good manufacturing practices
GPT	Growth promotion test
HEPA	High efficiency particulate air
HPLC	High performance liquid chromatography (or high performance liquid chromatography equipment)
HVAC	Heating, ventilation and air conditioning
IQ	Installation qualification
LAF	Laminar air flow
LIMS	Laboratory information management system
MB	Microbiology

MBL	Microbiology laboratory
MF	Master formulae
MFT	Media fill Test
MR	Management review
NC	Non conformity
NRA	National regulatory authority/agency
OQ	Operational qualification
PHA	Process hazard analysis
PLC	Programmable logic controller
PM	Preventive maintenance
PQ	Performance qualification
PQR	Product quality review
PQS	Pharmaceutical quality system
PW	Purified water
QA	Quality assurance
QC	Quality control
QCL	Quality control laboratory
QMS	Quality management system
QRM	Quality risk management
RA	Risk assessment
RCA	Root cause analysis
RO	Reverse osmosis
SIP	Sterilization in place
SMF	Site master file
SOP	Standard operating procedure
URS	User requirements specifications
UV	Ultraviolet-visible spectrophotometer
WFI	Water for injection

Part 2	**Summary of the findings and comments**

1. Pharmaceutical quality system

Since the merger of UCL with Strides Pharma Science Limited, UCL had implemented a QMS under the umbrella of Corporate Quality Practices to harmonize quality principles and approaches across all Strides sites. The Quality Policy that governed the principles behind the UCL QMS was designed by the Corporate Quality Team. There were two types of procedures in place, namely Group Quality Procedures and Site-Specific Procedures. UCL had adapted certain practices from the Group procedures to suit the site-specific organization practices. Documentation was controlled by the QA Department. Semi-finished and finished products were released by the QA department based on the principles described in a written procedure. SAP was used for the management of raw materials, intermediates, and finished products.

Product Quality Review

PQRs followed the principles detailed in a procedure. According to the SOP, an evaluation of each product was conducted annually for batches produced during January to December, to confirm the quality standards, specifications and to ensure consistency of existing processes for the

manufacture of a given product. The procedure also included a description of the statistical tools used to evaluate the control over manufacturing processes and product critical quality attributes. PQRs were carried out based on an annual plan. The annual PQR plans for the review periods 2021-2022 and 2022-2023 were checked. The following PQRs were reviewed in detail:
PQR TLD fc tab, review period January 2022-December 2022.
PQR Sulfadoxine Pyrimethamine DT 500mg/25mg, review period January 2020-November 2022.

Deviations
There was a procedure in place for managing deviations. The SOP adequately described the steps for reporting, assessing, investigating, applying remedial actions, documenting, and closing out a deviation. It was applicable to all GMP related activities and operations on-site when a departure from the approved instructions or the established standard or in case an incident in which a non-conformance or failure was observed. Deviations were logged in TrackWise and were classified into critical, major, or minor.
The lists of deviations for 2022 and 2023 were reviewed and several examples of deviation handling were checked in detail.

Change Control
A formal system for change management was described in a written procedure. The SOP provided a procedure for initiating temporary and permanent changes. The changes were logged in TrackWise and classified into major, moderate, or minor. An annual trend report was generated.
The change control logs for 2022 and 2023 were spot-checked and examples of change control were reviewed in detail.

Quality Risk Management
QRM principles were integrated into different aspects of the pharmaceutical quality system. A procedure for conducting risk assessments was in place and several procedures had integrated risk assessment as part of the process (e.g., handling of deviations, change management, equipment qualification). An example of equipment risk assessment was reviewed

All the non-compliances relating to the PQS were addressed by the manufacturer, to a satisfactory level, prior to the publication of the WHOPIR.

2. Good manufacturing practices for pharmaceutical products

Basic principles of good manufacturing practices were generally well defined in SOPs and implemented. Manufacturing processes were adequately described and documented in BMRs and BPRs. Records were completed during manufacture. Qualifications and validations were performed according to prepared protocols. Required resources were available, including adequate premises, equipment, and utilities as well as qualified and trained personnel. The batch manufacturing records for affected TLD batches were reviewed and discussed.
All the non-compliances were addressed by the manufacturer, to a satisfactory level, prior to the publication of the WHOPIR.

3. Sanitation and hygiene

Premises and equipment were generally maintained at an acceptable level of cleanliness, and they were appropriately labelled. There were cleaning procedures in place for facilities and equipment.

In general facilities were found to be tidy. Pictorials of gowning instructions were posted on personnel entry rooms.

4. Qualification and validation

A Corporate Validation Master Plan was presented. The VMP described the sequence of activities to ensure that the manufacturing facilities, equipment, instruments, utilities, and systems were maintained in a validated state. It further described the responsibilities of cross-functional teams involved in validation exercises. The VMP also provided information on equipment qualification lifecycle and defined URS, DQ, FAT, IQ, OQ, PQ.

Temperature and relative humidity mapping of the refrigerated container.

The protocol and report of the mapping exercise were reviewed. 15 dataloggers were used and the mapping exercise took place for 3 days during the summer season in both empty and loaded state. The temperature accuracy of the sensors was ±0.5^{o}C and the data logging interval was set to 60 sec.

Induction Sealing Challenge Test

Following the induction sealing issues reported in TLD 300/300/50mg f.c tabs complaints, the company performed challenge tests to check the integrity and robustness of the induction sealing step for HDPE bottles containing 30 tablets and 90 tablets, by altering the following parameters on the jar packaging line:

i. height between sealing head and cap
ii. temperature (heating or sealing power)
iii. conveyor speed.

The report concluded that the jar packaging line had to be requalified.

Qualification of the jar packaging line

The original installation qualification was spot-checked. In addition, the requalification reports were reviewed in detail.

Qualification of Tablet Coating System

The URS was presented. The technical characteristics and performance features were adequately defined.

IQ was performed by the manufacturer of the coating system. The IQ report was reviewed.

OQ was also performed by the manufacturer of the coating system. The OQ report was presented.

Cleaning validation

Cleaning validation was performed in accordance with a written SOP.

The following documents were reviewed in detail:

- Equipment master list for tablets/capsules.
- API Master List.
- Identification of worst-case molecule.
- PDE determination for Tenofovir disoproxil fumarate.
- Periodic cleaning monitoring calendar 2022-2023.
- Verification of all sampling locations for equipment used in cleaning validation.
- Cleaning verification/validation protocol for the compression 55 station machine
- Cleaning verification/validation report for the compression 55 station machine.
- Cleaning verification/validation protocol for the coating system.
- Cleaning verification/validation report for the coating system.

- Dirty Equipment Hold Time Study and Report covering the rapid mixer granulator, the FBD, the Blender, the Multimill, the Vibrosifter and the paste preparation vessel.

Water Systems

Physical and chemical testing of water was performed according to a written procedure. The diagrams for the potable water system and the PW generation system and loop were presented. In addition, the 2022 Microbiological Monitoring Trend Review of Potable Water, and PW were reviewed.

All the non-compliances relating to Validation/Qualification were addressed by the manufacturer, to a satisfactory level, prior to the publication of the WHOPIR.

5. Complaints

The management of market complaints was handled according to a written procedure. The procedure defined the process for receipt, registration, investigation, documentation, and disposition of a market complaint as well as identification, and implementation of CAPAs. The procedure was applicable to customer complaints of any FPP manufactured or distributed by Strides. The complaints were handled using the TrackWise Document Management System. Based on the relative SOP, market complaints were trended annually, and a report was compiled. The reports for 2021 and 2022, were discussed.

The cascade of events and the relevant documentation in relation to the Tenofovir 300mg/Lamivudine 300 mg/Dolutegravir 50 mg fc tabs, complaints were reviewed in detail. The complaints were related to product defects reported by the Pharmacy & Poisons Board of Kenya to the company and included discolored induction seal, black spots on tablets and broken or chipped tablets.

The company carried out several investigations. The CAPA included changes in product specifications, IPC, manufacturing, and packaging process instructions. A report on affected batches and relating defects was made available.

All the non-compliances relating to the TLD complaints handling were addressed by the manufacturer, to a satisfactory level, prior to the publication of the WHOPIR.

6. Product recalls

A corporate procedure was in place for withdrawing non-conforming products from the market. The procedure was applicable to all products manufactured or distributed by Strides or its subsidiaries including investigational medicinal products. Based on the extent, and nature of the health hazard, the recall could be categorized as Class I, II, III or IV (Class I being the most critical). Recalls were logged in the TrackWise system. There was a provision for conducting a mock recall annually in case a recall had not been carried out in the previous year.

The recall of TLD batches was reviewed in detail. A target date for closing out the recall was set. The product had been distributed to 1454 entities, in 47 counties. At the time of inspection, quantities from 1412 entities were verified, quarantined, and returned to UCL. The relative documentation regarding receiving facilities/entities, quantities distributed, quantities quarantined, and exchange of communication with the facilities were reviewed.

In addition, a health hazard evaluation to determine the potential risk on patient health was carried out. The report was briefly reviewed and did not give rise to any observations.

The recalled TLD batches were appropriately stored, labelled and segregated in the finished product warehouse. The recalled product quantities were registered in the Returned goods register logbook.

All the non-compliances relating to the TLD recall were addressed by the manufacturer, to a satisfactory level, prior to the publication of the WHOPIR.

7. Contract production, analysis and other activities

Manufacture of WHO Prequalified products was not contracted out. A commercial lease agreement was established for the rental of a refrigerated container to be used for the storage of temperature sensitive materials. The agreement was valid for one year. The responsibilities of each party were defined in the contract.

All the non-compliances were addressed by the manufacturer, to a satisfactory level, prior to the publication of the WHOPIR.

8. Self-inspection, quality audits and suppliers' audits and approval

A procedure for the evaluation and qualification of suppliers was presented. The procedure described how new vendors were identified, selected, evaluated, and approved. Suppliers were monitored annually and requalified every three years. The evaluation was performed at corporate level and audits were carried out by experts employed at corporate level. Examples of annual evaluation reports and audits were checked in detail.

Due to time constraints, self-inspection was not covered in detail.

All the non-compliances were addressed by the manufacturer, to a satisfactory level, prior to the publication of the WHOPIR.

9. Personnel

There were approximately 270 staff working on site. In general, personnel had the necessary qualification and practical experience. Responsibilities and duties of key personnel were adequately defined in job descriptions. The organogram reflecting administrative structure as well as departmental hierarchy was reviewed.

10. Training

Procedures for training were available and different training types were applicable (e.g., general training, classroom training, self-training etc.). An annual training plan was compiled at the end of each year for the following year considering the different components of the PQS. Self-training was made available to employees by using an electronic platform/database and evaluation was performed electronically. Training records for production equipment and laboratory instrument operation were spot-checked.

11. Personal hygiene

Personal hygiene at the facility was guided by written procedures. The SOPs described the various hygiene practices aimed at protecting product quality. The hygiene practices included hand washing and gowning instructions, reporting of illness, exclusion of certain practices in production areas. In general personnel followed good hygiene practices.

12. Premises

Generally, premises were maintained to suit the operations carried out. As noted in previous inspection reports, there were some limitations in facility design in terms of minimizing accidental errors of mix ups and contamination. Layouts of the facilities were made available. The tableting facilities were equipped with single pass air circulation system. Adequate pressure cascade was implemented to ensure containment whereas in powder generation areas negative pressure was maintained. There were general procedures in place for cleaning the facilities. The SOP on cleaning of production areas was reviewed.

13. Equipment

In general, equipment was installed and adequately maintained to suit the requirements for the dosage forms manufactured. Production equipment was of good standard and appeared to be well maintained. The workflow in the facility was appropriately designed, and the equipment appeared to be installed to facilitate production and reduce the risk of contamination and mix ups. All production equipment reviewed was identified as to its content or cleanliness status by appropriate labels. Cleaning and equipment maintenance logbooks were established.

The main equipment used for the manufacture of TLD included the Rapid Mill Granulator, the Jacketed Paste Vessel, the Vibro Sifter, the Fluid Bed Dryer, the Auto-coater Machine or the Coating System, the Co-Mill, Bin Blenders, the 55 Station compression machine, and the Jar Packing line.

Maintenance logbooks and procedures were in place for each equipment. The SOP on dismantling, cleaning, assembly, and operation of coating system as well as the use and maintenance logbooks of the coating system were reviewed.

All the non-compliances were addressed by the manufacturer, to a satisfactory level, prior to the publication of the WHOPIR.

14. Materials

There were procedures in place describing receipt, storage, and management of raw materials. Incoming materials were purchased from approved vendors, sampled and tested according to specifications and testing procedures. Upon receipt of raw and packaging materials, the materials were recorded in a logbook-register. SAP was used to manage materials, intermediates and finished product inventory and status. The procedures for preparation of GRN in SAP, receipt, storage, and handling of raw and packaging materials and the procedure for warehouse operations were reviewed.

The storage areas for quarantine and approved raw materials were visited. All materials were labelled with the appropriate labels based on their status, for example under quarantine, approved. SAP was used to generate these labels. A logbook for registering reprinted labels was in place.

Sampling of raw and packaging materials was performed in separate rooms. The logbook of the packaging materials sampling LAF, the logbook of the sampling booth for raw materials as well as the logbook for operation of the HVAC system in the sampling area were reviewed.

Finished products were sampled and analyzed by QC before transfer to the warehouse. The finished products were transferred to the finished product Quarantine Area and released for

dispatch after the completion of finished product analysis, review of the batch record documents and generation of the Certificate of Analysis.

Recalled products were stored in the finished product warehouse and were appropriately labelled and segregated. Returned products were also stored in the finished product warehouse but they were not appropriately labelled. The recalled and returned goods were registered in a logbook.

All the non-compliances were addressed by the manufacturer, to a satisfactory level, prior to the publication of the WHOPIR.

15. Documentation

A documentation system was in place. Procedures defined and supported manufacturing and quality control operations. In general documents were approved, signed, and dated by appropriate responsible persons, reviewed, and kept up to date. Most of the SOPs were of the Global Quality type. Electronic documentation management systems were put in place for handling procedures, specifications, and records.
Approved specifications and testing procedures were available for raw materials, packaging materials and finished products.
All the non-compliances were addressed by the manufacturer, to a satisfactory level, prior to the publication of the WHOPIR.

16. Good practices in production

A visit to the production areas was made. At the time of the inspection there were ongoing production operations. Areas inspected included the dispensaries, the granulation area, the punches and dies storage room, the hoses/sieves/finger bags storage room, compression machines suites (9 compression machines), coating rooms, IPC laboratory, primary packaging in bottles and secondary packaging. Temperature, relative humidity, and pressure differentials were monitored. Rooms and equipment were appropriately labelled.

The SOP on Coating process was reviewed.
The dispensing area was equipped with 4 dispensing booths and balances, washing area and storage of scoops area. The washing area was remodeled following the observations of the last inspection. The IPC laboratory was equipped with a friability tester, a disintegration tester, a leak test apparatus, a hardness tester, a moisture analyzer, a balance, and a pH/conductivity meter.
During the tour, the following were checked:

- TLD BPR batch:5811978 (packaging was in progress)
- Pyridoxine 50mg BMR batch:5811926 (granulation was in progress).
- Sulfran tab BMR batch: 5812044 (compression was in progress).
- The balance logbook (capacity 30 Kg).
- The calibration certificate of standard weights.
- The daily dispensing and cleaning logbook.
- The coating machine logbook

All the non-compliances were addressed by the manufacturer, to a satisfactory level, prior to the publication of the WHOPIR.

17. Good practices in quality control

Quality Control (QC) operations were independent of production. The QC laboratory was well equipped. The QC was divided into physico-chemical and microbiological control laboratory. LIMS software was used for the handling of raw materials, semi-finished products, in-process, packaging materials, finished product samples, standards (reference standards, in-house standards), and issuing certificates of analysis. All HPLCs were managed through Chromeleon 7.2 software.

With regards to the physico-chemical laboratory the following documents and equipment were reviewed:

- The raw material sample movement register and the register for Sulfamethoxazole BP batch:10000453031.
- The sampling procedure for raw materials.
- The sampling, testing and approval of raw materials SOP.
- The sampling, testing and approval of packaging materials SOP
- SOP for handling of raw data sheet, assigning test results, recording and disposition
- The sample register for finished product as well as the register for Sulfran DS batch: 5811960.
- The reduced testing program.
- The specifications for Trimethoprim as well as the analytical report for Trimethoprim BP batch: TMP22100828.
- The specifications for TLD as well as the analytical reports for TLD batches: 5809768 and 5811078.
- The analytical record for Sulfamethoxazole and Trimethoprim tab 800mg/160mg batch: 5810584.
- The analytical record for Sulfran DS batch: 5811189.
- The analytical record for HDPE white plastic container (250 cc) batch:190577326.
- The SOP for handling and maintenance of laboratory analytical standards as well as the handling of RS Tenofovir and WS Lamivudine.
- The requalification of dissolution apparatus.
- The Amodiaquine 75mg dispersible tablets dissolution study.

All the non-compliances were addressed by the manufacturer, to a satisfactory level, prior to the publication of the WHOPIR.

Part 3	**Conclusion – Inspection outcome**

Based on the areas inspected, the people met and the documents reviewed, and considering the findings of the inspection, including the observations listed in the Inspection Report, ***Universal Corporation Limited (UCL),*** located ***at Club Road, Past Kikuyu Post Office P.O. BOX 1748-00902, Kikuyu town, Kikuyu, Kenya*** was considered to be operating at an acceptable level of compliance with WHO GMP Guidelines.

All the non-compliances observed during the inspection that were listed in the full report as well as those reflected in the WHOPIR, were addressed by the manufacturer, to a satisfactory level, prior to the publication of the WHOPIR.

This WHOPIR will remain valid for 3 years, provided that the outcome of any inspection conducted during this period is positive.

Part 4	List of WHO Guidelines referenced in the inspection report

1. WHO good manufacturing practices for pharmaceutical products: main principles. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Forty-eight Report Geneva, World Health Organization, 2014 (WHO Technical Report Series, No. 986), Annex 2.
   Short name: WHO TRS No. 986, Annex 2
   https://www.who.int/publications/m/item/trs986-annex2

2. WHO good manufacturing practices for active pharmaceutical ingredients. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Forty-fourth Report. Geneva, World Health Organization, 2010 (WHO Technical Report Series, No. 957), Annex 2.
   Short name: WHO TRS No. 957, Annex 2
   https://www.who.int/publications/m/item/annex-2-trs-957

3. WHO guidance on good practices for desk assessment of compliance with good manufacturing practices, good laboratory practices and good clinical practices for medical products regulatory decisions. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Fifty-second Report. Geneva, World Health Organization, 2018 (WHO Technical Report Series, No. 1010), Annex 9.
   Short name: WHO TRS 1010, Annex 9
   https://www.who.int/publications/m/item/trs1010-annex9

4. WHO Good Manufacturing Practices: water for pharmaceutical use. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Fifty-fifth Report. Geneva, World Health Organization, 2021 (WHO Technical Report Series, No. 1033), Annex 3.
   Short name: WHO TRS No. 1033, Annex 3
   https://www.who.int/publications/m/item/annex-3-trs-1033

5. WHO guidelines for sampling of pharmaceutical products and related materials. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Thirty-ninth Report. Geneva, World Health Organization, 2005 (WHO Technical Report Series, No. 929), Annex 4.
   Short name: WHO TRS No. 929, Annex 4
   https://www.who.int/publications/m/item/annex-4-trs-929

6. WHO good practices for pharmaceutical quality control laboratories. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Forty-fourth Report. Geneva, World Health Organization, 2010 (WHO Technical Report Series, No. 957, Annex 1.
   Short name: WHO TRS No. 957, Annex 1
   https://www.who.int/publications/m/item/trs957-annex1

7. WHO Good Practices for Pharmaceutical Products Containing Hazardous Substances. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Forty-fourth Report. Geneva, World Health Organization, 2010 (WHO Technical Report Series, No. 957), Annex 3.

Short name: WHO TRS No. 957, Annex 3
https://www.who.int/publications/m/item/trs957-annex3

8. Guidelines on heating, ventilation and air-conditioning systems for non-sterile pharmaceutical products. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Fifty Second Report Geneva, World Health Organization, 2018 (WHO Technical Report Series, No. 1010), Annex 8.
Short name: WHO TRS No. 1010, Annex 8
https://www.who.int/publications/m/item/Annex-8-trs-1010

9. Guidelines on heating, ventilation and air-conditioning systems for non-sterile pharmaceutical products. Part 2: Interpretation of Guidelines on heating, ventilation and air-conditionning systems for non-sterile pharmaceutical products. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Fifty-Third Report Geneva, World Health Organization, 2018 (WHO Technical Report Series, No. 1019), Annex 2.
Short name: WHO TRS No. 1019, Annex 2
https://www.who.int/publications/m/item/trs1019-annex2

10. WHO guidelines on transfer of technology in pharmaceutical manufacturing WHO Expert Committee on Specifications for Pharmaceutical Preparations. Fifty-Fifth Report Geneva, World Health Organization, 2022 (WHO Technical Report Series, No. 1044), Annex 4.
Short name: WHO TRS No. 1044, Annex 4
https://cdn.who.int/media/docs/default-source/medicines/norms-and-standards/guidelines/production/trs1044-annex4-technology-transfer-in-pharmaceutical-manufacturing.pdf

11. WHO good manufacturing practices for sterile pharmaceutical products. Expert Committee on Specifications for Pharmaceutical Preparations. Fifty-Fifth Report Geneva, World Health Organization, 2022 (WHO Technical Report Series, No. 1044), Annex 4.
Short name: WHO TRS No. 1044, Annex 2
https://www.who.int/publications/m/item/trs1044-annex2

12. General guidelines for the establishment maintenance and distribution of chemical reference substances. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Forty-First Report Geneva, World Health Organization 2007 (WHO Technical Report Series, No.943) Annex 3. ***Short name: WHO TRS No. 943, Annex 3***
https://www.who.int/publications/m/item/trs943-annex3

13. WHO good practices for pharmaceutical microbiology laboratories. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Forty-Fifth Report Geneva, World Health Organization, 2011 (WHO Technical Report Series, No. 961), Annex 2.
Short name: WHO TRS No. 961, Annex 2
https://www.who.int/publications/m/item/trs961-annex2

14. WHO guidelines on quality risk management. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Forty-Seventh Report Geneva, World Health Organization, 2013 (WHO Technical Report Series, No. 981), Annex 2.
Short name: WHO TRS No. 981, Annex 2

https://www.who.int/publications/m/item/trs981-annex2

15. WHO guidelines on variation to a prequalified product. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Forty-Seventh Report Geneva, World Health Organization, 2013 (WHO Technical Report Series, No. 981), Annex 3.
Short name: WHO TRS No. 981, Annex 3
https://www.who.int/publications/m/item/annex-3-trs-981

16. WHO guidelines for drafting a site master file. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Forty-Fifth Report Geneva, World Health Organization, 2011 (WHO Technical Report Series, No. 961), Annex 14.
Short name: WHO TRS No. 961, Annex 14
https://www.who.int/publications/m/item/tr961-annex14

17. Good Manufacturing Practices: Guidelines on validation. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Fifty-Third Report Geneva, World Health Organization, 2019 (WHO Technical Report Series, No. 1019), Annex 3.
Short name: WHO TRS No. 1019, Annex 3
https://www.who.int/publications/m/item/trs1019-annex3

18. WHO General guidance on hold-time studies WHO Expert Committee on Specifications for Pharmaceutical Preparations. Forty-Ninth Report Geneva, World Health Organization, 2015 (WHO Technical Report Series, No. 992), Annex 4.
Short name: WHO TRS No. 992, Annex 4
https://www.who.int/publications/m/item/trs992-annex4

19. Model guidance for the storage and transport of time-and temperature-sensitive pharmaceutical products. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Forty-Fifth Report Geneva, World Health Organization, 2011 (WHO Technical Report Series, No. 961), Annex 9.
***Short name: WHO TRS No. 961, Annex* 9**
https://www.who.int/publications/m/item/trs961-annex9-modelguidanceforstoragetransport

20. WHO Technical supplements to Model Guidance for storage and transport of time – and temperature – sensitive pharmaceutical products. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Forty-Ninth Report Geneva, World Health Organization, 2015 (WHO Technical Report Series, No. 992), Annex 5.
Short name: WHO TRS No. 992, Annex 5
https://www.who.int/publications/m/item/trs992-annex5

21. WHO Recommendations for quality requirements when plant – derived artemisinin is used as a starting material in the production of antimalarial active pharmaceutical ingredients. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Forty-Ninth Report Geneva, World Health Organization, 2015 (WHO Technical Report Series, No. 992), Annex 6.
Short name: WHO TRS No. 992, Annex 6
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