



Medical Device Manufacturing Glossary and Informative Document

This medical device manufacturing glossary and informative document is intended to not only explain the meanings of certain acronyms and terminology used by Eastek International in our communication involving all manufacturing of medical devices, but also exemplifying and illustrating the quality management system requirements, regulations, planning, and testing procedures in which Eastek holds high emphasis on throughout the full development of our customers' medical manufacturing needs.

Eastek is a provider of medical devices and is therefore under the jurisdiction of the FDA to comply with their rules and regulations for medical devices.

The vision of Eastek is to meet and exceed our customer's quality and delivery requirements at the lowest possible cost. Through continual improvement efforts, our employees are dedicated to enhance the effectiveness of our quality management system and embrace all our customer's needs.

DI (DESIGN INPUTS) – is the starting point for product design. The requirements that form the design input establish a basis for performing subsequent design task and validating the design.

- Establish and maintain procedures to ensure that the design requirements relating to a device are appropriate and address the intended use of the device.
- The approval, including the date and signature of the individual(s) approving the requirements, shall be documented.

DO (DESIGN OUTPUTS) – as a general rule, an item is a design output if it is a work product, or deliverable item, of a design task listed in the design and development plan. Design outputs include "production specifications" (drawings and documents used to procure components, e.g. assembly drawings) as well as "descriptive materials" (other DO items might be produced which are necessary to establish conformance to design input requirements, but are not used in its production, e.g. the results of a risk analysis) which define and characterize the design.

- The manufacturer proactively can specify the form and content of design output at the planning stage.
- Form and content can be reviewed retroactively as a part of the design verification process.

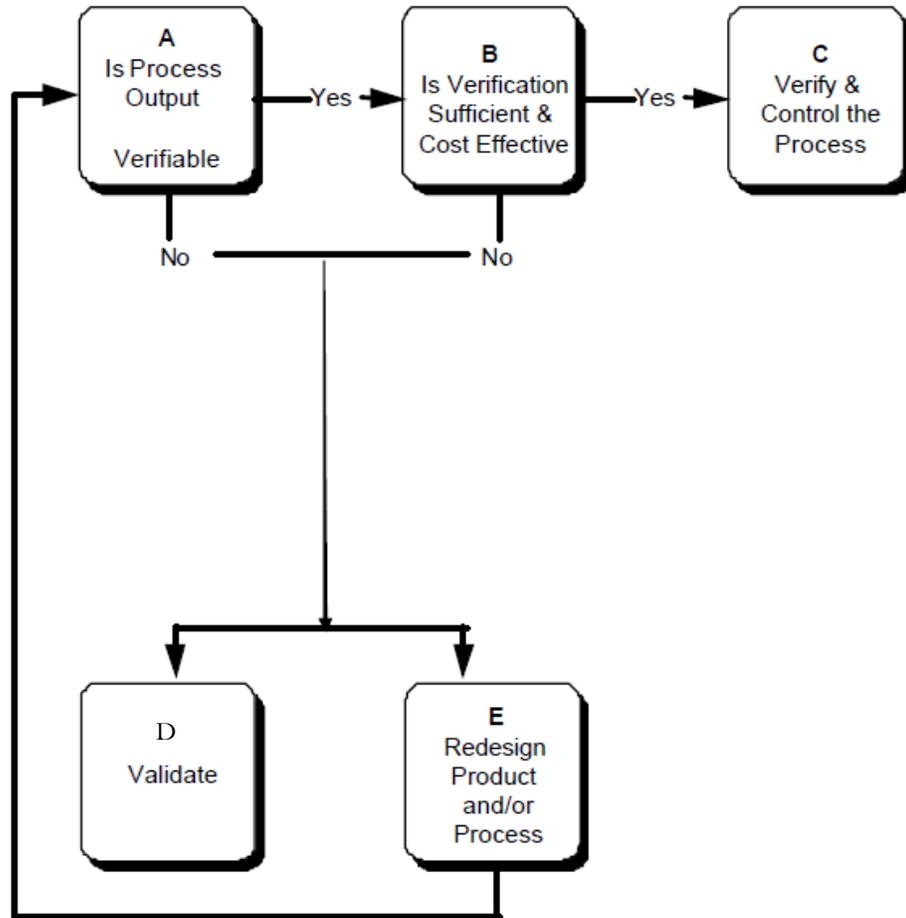
PV (PROCESS VALIDATION) – establishing by objective evidence that a process consistently produces a result or product meeting its predetermined requirements.

Process validation is part of the integrated requirements of a quality management system. It is conducted in the context of a system including design and development control, quality assurance, process control, and corrective and preventive action.

Candidates for PV include:

- Sterilization
- Aseptic processing
- Injection molding
- Welding

The following model may be useful in determining whether or not a process should be validated:



Advantages to Process Validation:

- More consistent quality
- Increased output
- Reduced testing and/or inspection
- Fewer complaints
- Less scrap, rework, and recalls

Three Elements of Process Validation:

1. Verify equipment is installed and operating properly (Installation Qualification)
2. Develop process that can produce product or result that meets all specifications (Operational Qualification)
3. Verify that process can produce product or result that meets all specifications consistently over time (Performance Qualification)

IQ (INSTALLATION QUALIFICATION) – establishing by objective evidence that all key aspects of the process equipment and ancillary system installation adhere to the manufacturer’s approved specification and that the recommendations of the supplier of the equipment are suitably considered.

IQ, simply put, asks the question: Is it installed correctly? Important IQ considerations are:

- Equipment design features (i.e. materials of construction cleanability, etc.)
- Installation conditions (writing, utilities, functionality, etc.)
- Calibration, preventative maintenance, cleaning schedules
- Safety features
- Supplier documentation, prints, drawing and manuals
- Software documentation
- Spare parts list
- Environmental conditions (such as clean room requirements, temperature, humidity)

OQ (OPERATIONAL QUALIFICATION) – establishing by objective evidence process control limits and action levels which result in product that meets all predetermined requirements.

In this phase the process parameters should be challenged to assure that they will result in a product that meets all defined requirements under all anticipated conditions of manufacturing. During routine production and process control, it is desirable to measure process parameters and/or product characteristics to allow for the adjustment of the manufacturing process at various action level(s) and maintain a state of control. These action levels should be evaluated, established, and documented during process validation to determine the robustness of the process and ability to avoid approaching “worst case conditions.”

OQ considerations include:

- Process control limits (time, temperature, pressure, line speed, setup conditions, etc.)
- Software parameters
- Raw material specifications
- Process Operating Procedures
- Material handling Requirements
- Process Change Control
- Training
- Short term stability and capability of the process (latitude studies or control charts)
- Potential failure modes, action levels and worst-case conditions (Failure Mode and Effects Analysis, Fault Tree Analysis)

PQ (PERFORMANCE QUALIFICATION) – establishing by objective evidence that the process, under anticipated conditions, consistently produces a product which meets all predetermined requirements.

In this phase the key objective is to demonstrate the process will consistently produce acceptable product under normal operating conditions. PQ considerations include:

- Actual product and process parameters and procedures established in OQ
- Acceptability of the product
- Assurance of process capability as established in OQ
- Process repeatability, long term process stability

Challenges to the process should simulate conditions that will be encountered during actual manufacturing.

Process and product data should be analyzed to determine what the normal range of variation is for the process output. Knowing the normal variation of the output is crucial in determining whether a process is operating in a state of control and is capable of consistently producing the specified output.

Process and product data should also be analyzed to identify any variation due to controllable causes. Depending on the nature of the process and its sensitivity, controllable causes of variation may include:

- Temperature
- Humidity
- Variations in electrical supply
- Vibration
- Environmental contaminants
- Purity of process water
- Light
- Human factors (training, ergonomic factors, stress, etc.)
- Variability of materials
- Wear and tear of equipment

DHF (DESIGN HISTORY FILE) – is the full set of records which define the “Design Inputs” and “Design Outputs” to the research efforts to create a new product.

DMR (DEVICE MASTER RECORD) – is the full set of records to define the manufacturing of a product such as (but not limited to) the BOM (Bill of Materials), product and component specifications, quality inspection requirements, packaging, labeling. Every FDA regulated product must have a DMR which is kept up-to-date using engineering controls.

BOM (BILL OF MATERIALS) – is a list of the raw materials, sub-assemblies, intermediate assemblies, sub-components, parts and the quantities of each needed to manufacture an end product. A BOM can define products as they are designed (engineering bill of materials), as they are ordered (sales bill of materials), as they are built (manufacturing bill of materials), or as they are maintained (service bill of materials or pseudo bill of material).

DHR (DEVICE HISTORY RECORD) – is the full set of records to define the specific manufacturing conditions (people, location, time materials, methods, equipment) used for a particular lot (defined quantity) of production. Every FDA regulated product must have a DHR.

LOT – documented volume of production delineated by a DHR.

DT (DESIGN TRANSFER) – is the process of transferring product design information (Production Specifications) to Manufacturing for the purposes of manufacturing the medical device. This is not a single event but happens throughout the whole design process in the form of documentation and training. Nevertheless the design transfer must be formalized and demonstrate verification and validation are successful at e.g. a pilot production run to determine the adequacy of full-scale manufacturing. With that it can be assured that the medical device can be repeatedly and reliably manufactured within product and process capabilities using the specifications as transferred to manufacturing.

DOE (DESIGN OF EXPERIMENTS) – is the design of any information-gathering exercises where variation is present. This branch of applied statistics deals with planning, conducting, analyzing and interpreting controlled tests to evaluate the factors that control the value of a parameter or group of parameters.

GMP (GOOD MANUFACTURING PRACTICE) – is the practice required in order to conform to guidelines recommended by agencies that control authorization and licensing for manufacturing. It is a system for ensuring that products are consistently produced and controlled according to quality standards. It is designed to minimize the risks involved in any pharmaceutical production that cannot be eliminated through testing the final product.

GMP covers all aspects of production from the starting materials, premises and equipment to the training and personal hygiene of staff. Detailed, written procedures are essential for each process that could affect the quality of the finished product. There must be systems to provide documented proof that correct procedures are consistently followed at each step in the manufacturing process - every time a product is made.

GMP requires:

- Instructions and procedures are written in clear and unambiguous language
- Operators are trained to carry out and document procedures
- Records of manufacture (including distribution) are retained in a comprehensible and accessible form
- Manufacturing processes are clearly defined and controlled
- A system is available for recalling any product from sale or supply
- Complaints for product quality defects are investigated, and appropriate measures are taken to prevent recurrence

GDP (GOOD DOCUMENTATION PRACTICE) – is a term (mainly in the medical industry) to describe standards by which documents are created in maintained.

What constitutes as GDP:

- Approve, review and update documents
- Changes and current revision status of documents identified
- Relevant versions of applicable documents available at points of use
- Documents remain legible and readily identifiable
- Documents of external origin identified and their distribution controlled
- Prevent unintended use of obsolete documents, and archiving

GHTF (GLOBAL HARMONIZATION TASK FORCE) – was “a voluntary group of representatives from national medical device regulatory authorities (such as the FDA) and the members of the medical device industry” whose goal was the standardization of medical device regulation across the world.

SOP (STANDARD OPERATING PROCEDURE) – is a set of directions and/or certain type of documentation that describes a step-by-step outline form how to perform a particular task or operation that should (must) be followed. There are certain sections and types of information that are typically included in an SOP:

- Title/Subject
- ID Number
- Effective Date and/or Revision Number
- Page Number
- Purpose
- Scope
- Responsibility
- Definitions
- Hazard Communication
- References
- Associated Forms
- Procedures

VERIFICATION & VALIDATION – are independent procedures that are used together for checking that a product, service, or system meets requirements and specifications and that it fulfills its intended purpose. These are critical components of a quality management system such as ISO 9000. Eastek always does a 100% inspection.

Verification is a process that is used to evaluate whether a product, service, or system complies with regulations, specifications, or conditions imposed at the start of a development phase.

Validation is a process of establishing evidence that provides a high degree of assurance that a product, service, or system accomplishes its intended requirements.

Maintaining a State of Validation:

- Monitor and control
- Changes in processes and/or product
- Continued state of control
- Revalidation if necessary

FDA QSR (21CFR820) – refers to the section of the US Federal Register (which is the formal proceedings of the US Congress including laws that are enacted) that explains the Medical Device manufacturing requirements.

Cpk – process capability index or measure of process capability (the ability of a process to produce output within specification limits) = volume of process which is within specified quality limits. Cpk measures how much natural variation a process experiences relative to its specification limits and allows different processes to be compared with respect to how well an organization controls them.

CAPA (CORRECTIVE ACTION & PREVENTIVE ACTION) – is the methodology for root cause analysis and permanent prevention. The purpose of a CAPA subsystem is to collect information, analyze information, identify and investigate product and quality problems, and take appropriate and effective corrective and/or preventive action to prevent their recurrence. Verifying or validating corrective and preventive actions, communicating corrective and preventive action activities to responsible people, providing relevant information for management review, and documenting these activities are essential in dealing effectively with product and quality problems, preventing their recurrence, and preventing or minimizing device failures. One of the most important quality system elements is the corrective and preventive action subsystem.

PROTOCOLS – report documenting methodology and results of protocol implementation.