

# UNENE Graduate Course Reactor Thermal-Hydraulics Design

McMaster University  
Whitby

March 1-2, March 15-16,  
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Introduction

Dr. Nik Popov

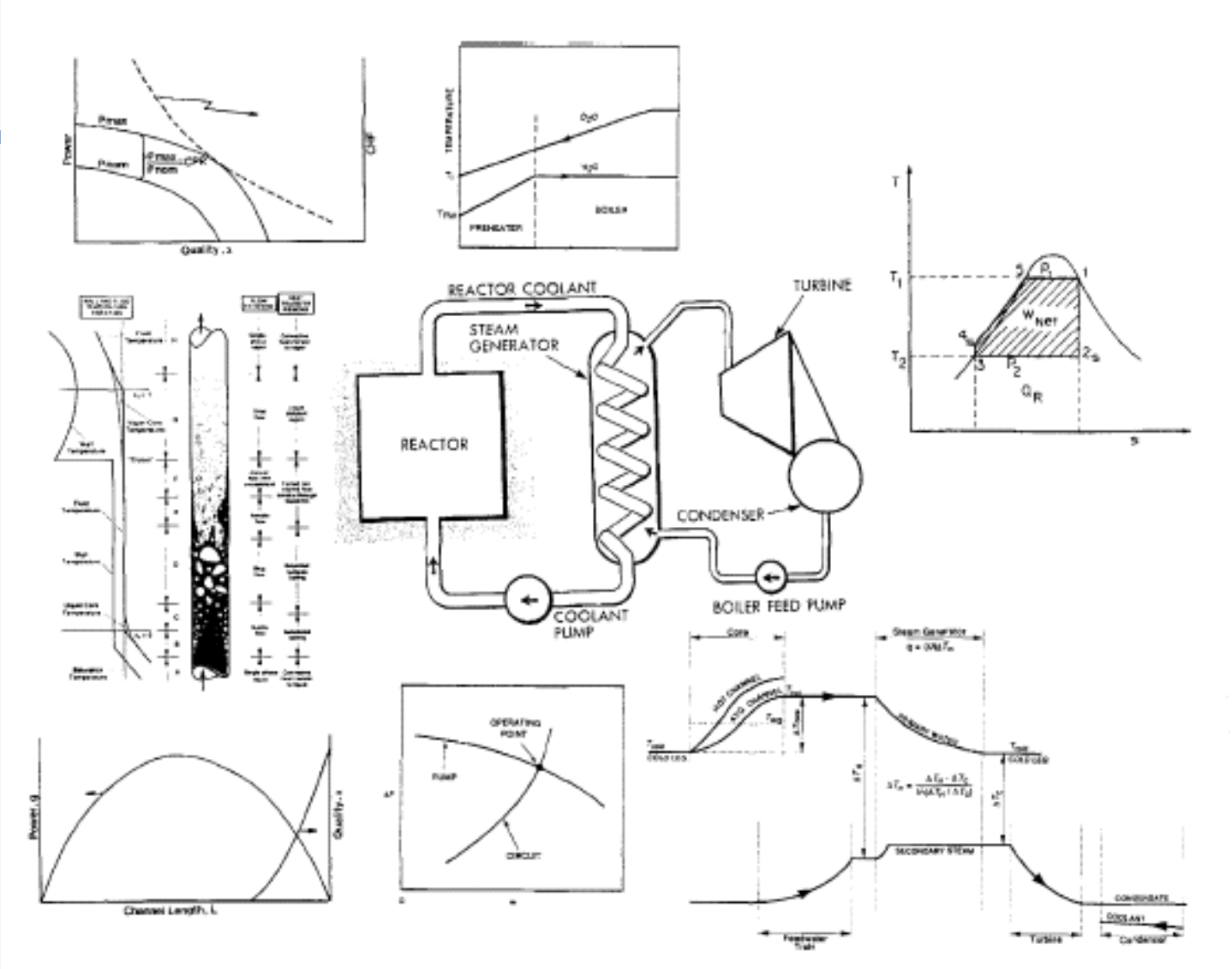
# Introduction to TH Design

- Course focused on TH design of the reactor core and heat transport system, and interrelated
  - systems, such as steam generators, turbines, etc., and
  - components, such as valves, pumps, pipes, heat exchangers, etc.
- Disciplines involved
  - Reactor physics
  - Heat transfer
  - Fluid mechanics
  - Thermodynamics
  - Stress analysis, etc

# Introduction to TH Design (cont'd)

- Important aspects to consider and optimize
  - Safety
  - Cost
  - Material limits (temps, mechanical stress, erosion, corrosion, etc.).
  - Regulations
  - Past experience
  - Standardized design requirements
  - Quality insurance
  - Marketability
- “Good design process is evolutionary”!

# Course Overall Scope Diagram



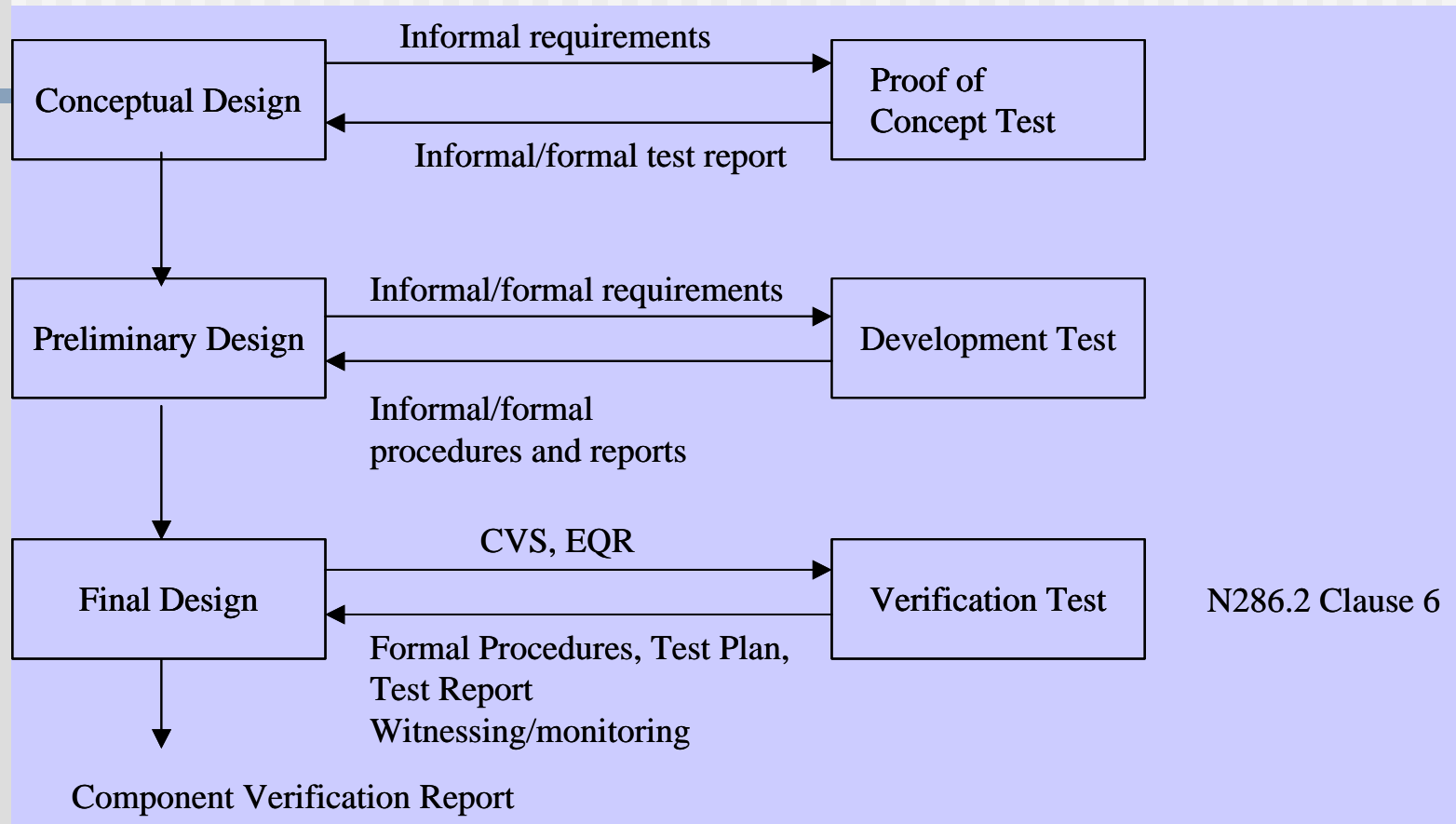
# The Design Process

- Design principles
  - Establish improved design practices
  - Take into account feedback from previous designs
  - Design more margins into the new designs
- Design methods
  - Analysis concepts
  - Design guides
  - Design tools
  - Verification
  - Training of staff
- Design Development

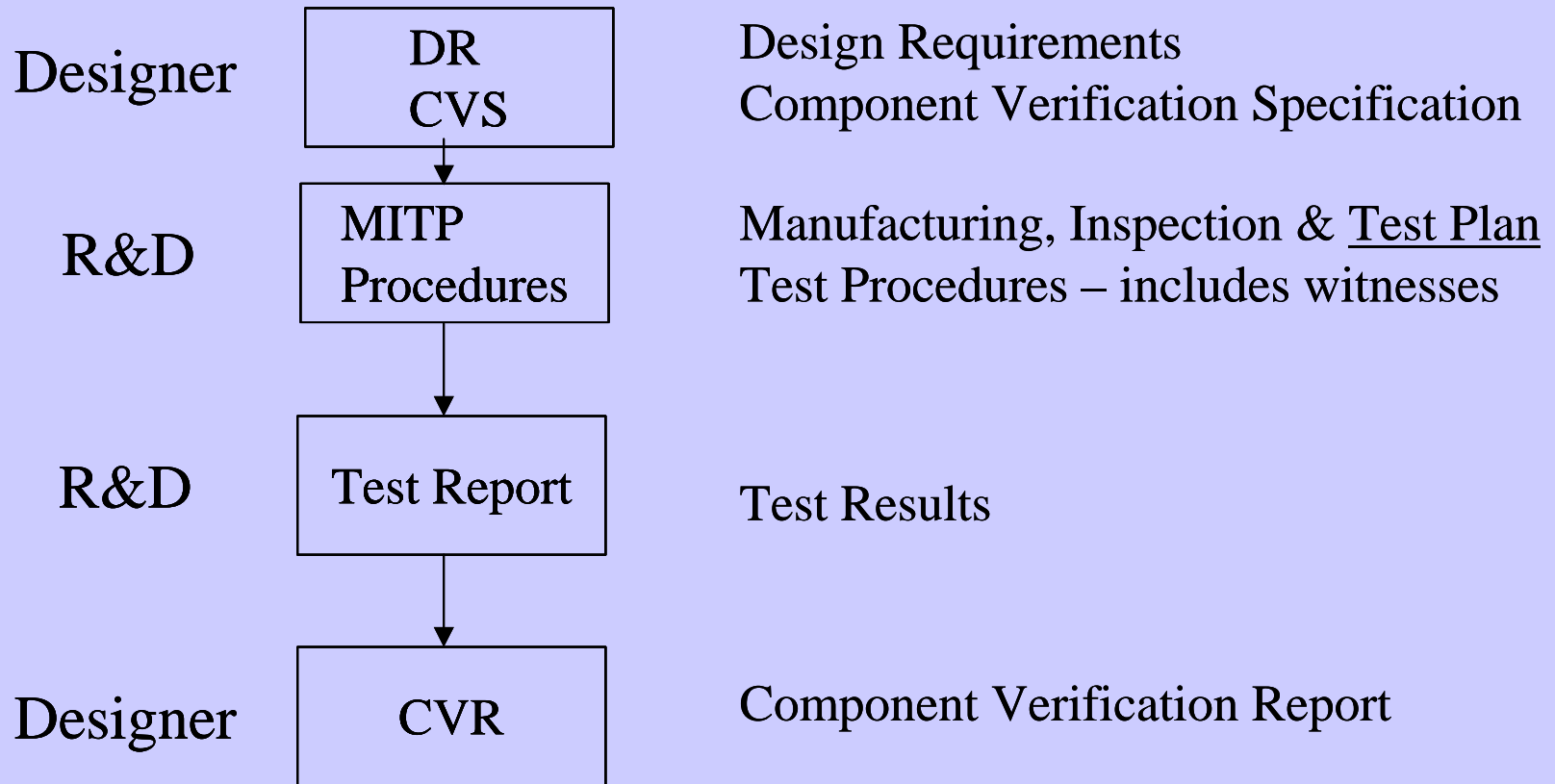
# The Design Process (cont'd)

- Design Development
  - Identify specific correlations and methodologies
  - Perform laboratory testing
  - Take into account feedback from sites
- Design
  - Establish main ground rules
  - Optimize design
  - Interaction between different design groups and disciplines
- Produce design documents
  - Design Requirements (DR)
  - Design Description (DD)
  - Design Manuals (DM)
  - Technical Descriptions (TD)
  - Generic Design Deviations (GDD)
  - Commissioning Procedures
  - Equipment Dockets

# Linkage Between Design and R&D

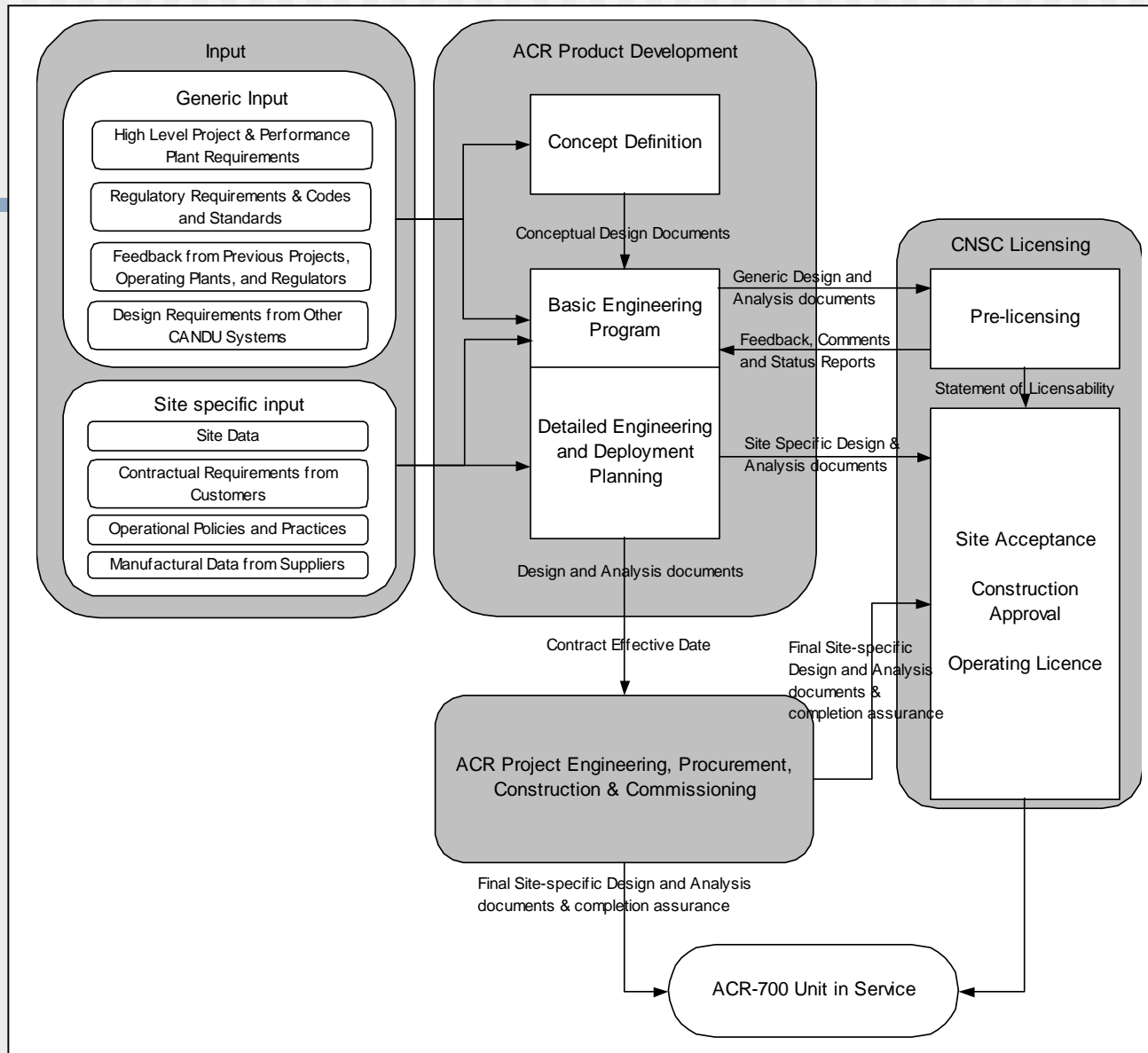


# Design Verification Process

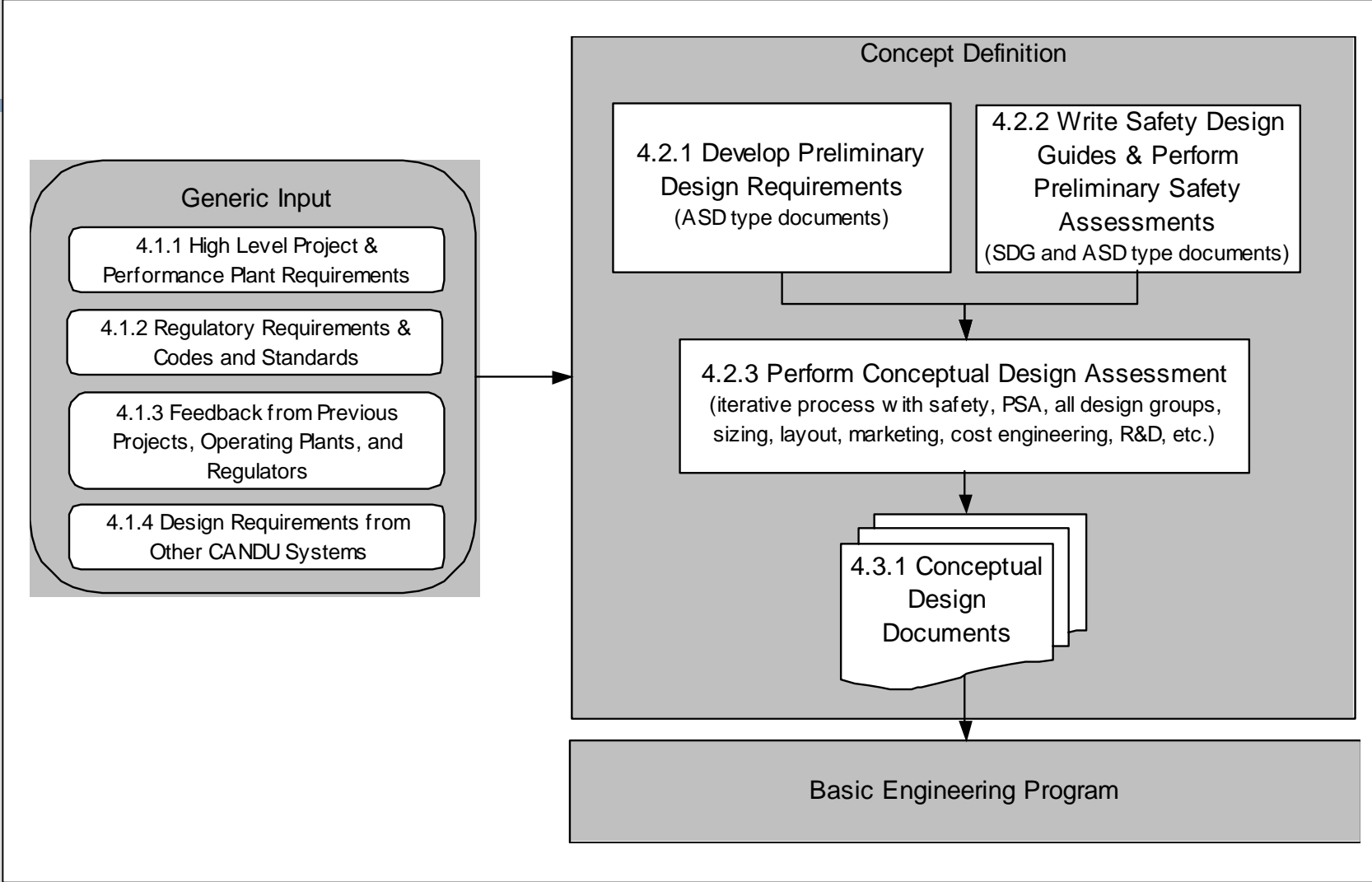


**Verification Testing at AECL carried out under specific procedures to meet N286.2 Clause 6 requirements.**

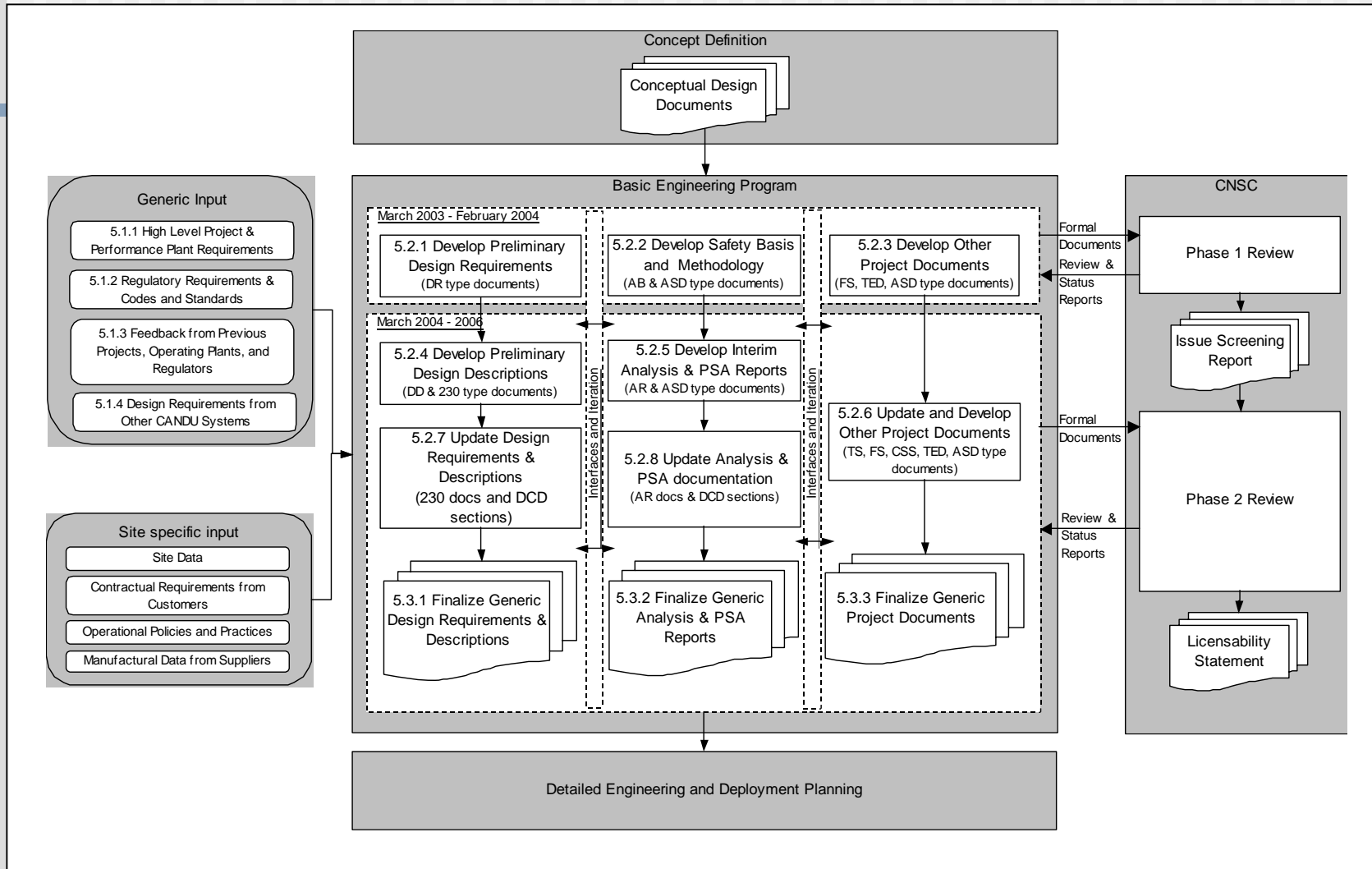
# Generic Design Process



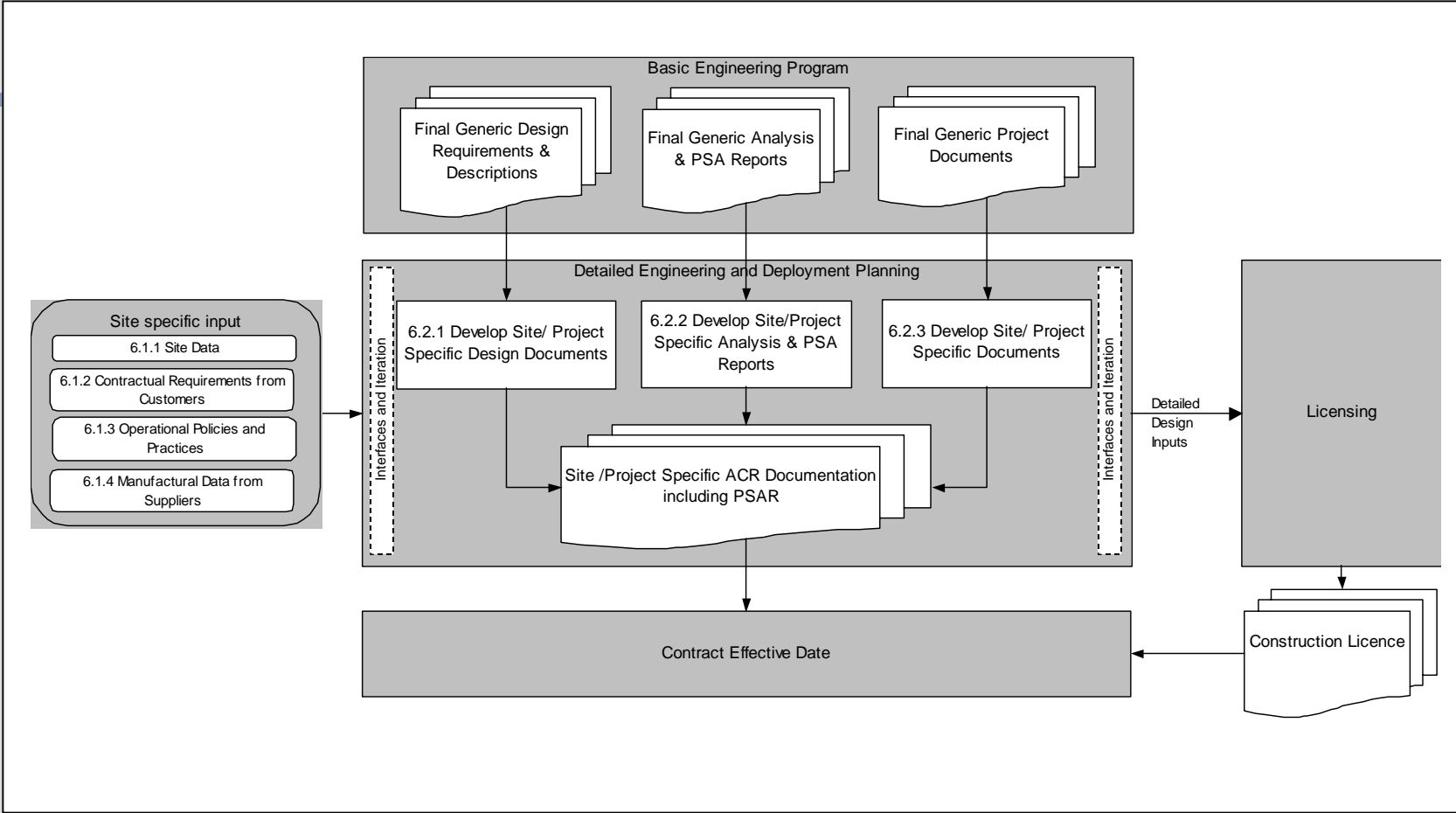
# Generic Design Process (cont'd)



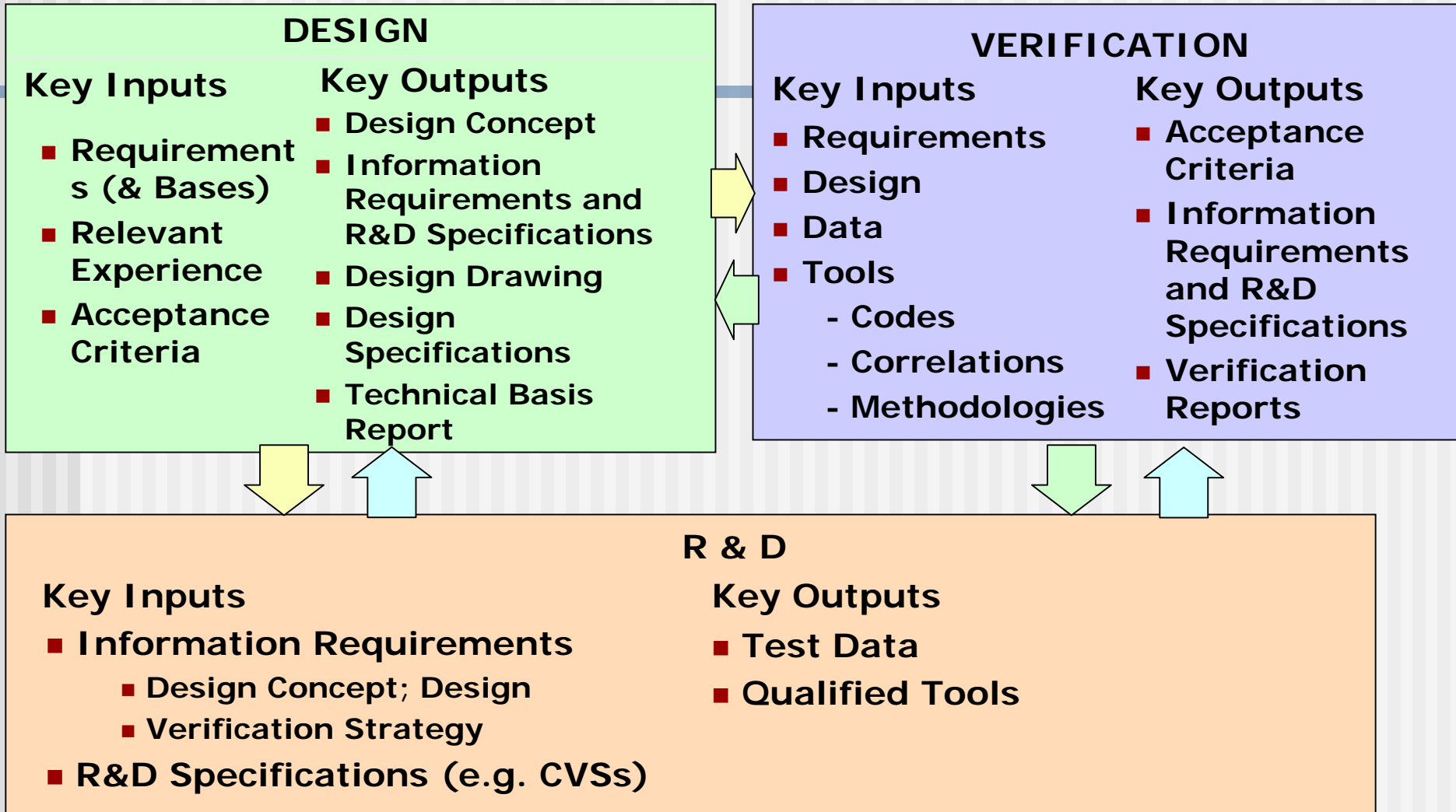
# Generic Design Process (cont'd)



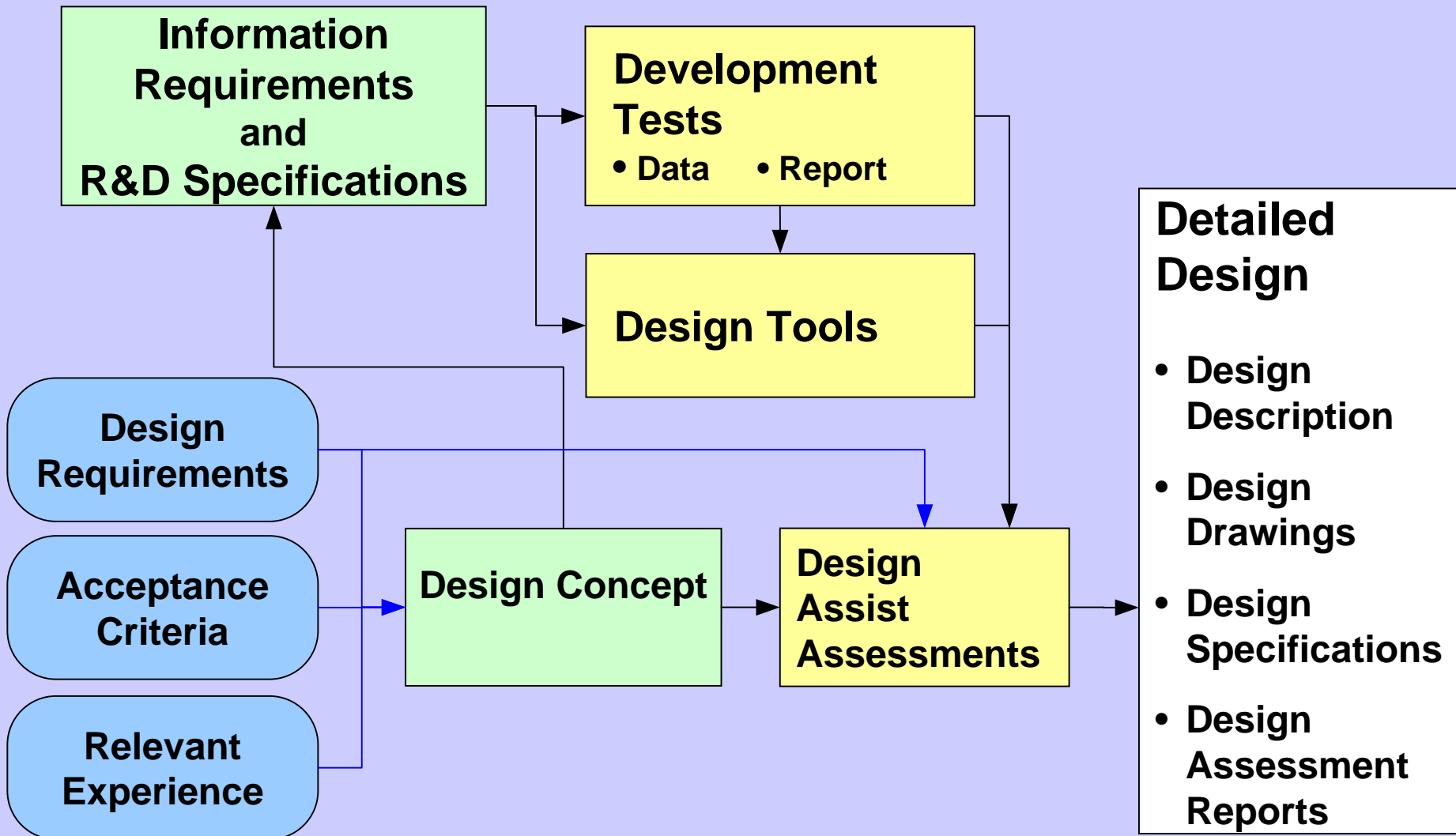
# Generic Design Process (cont'd)



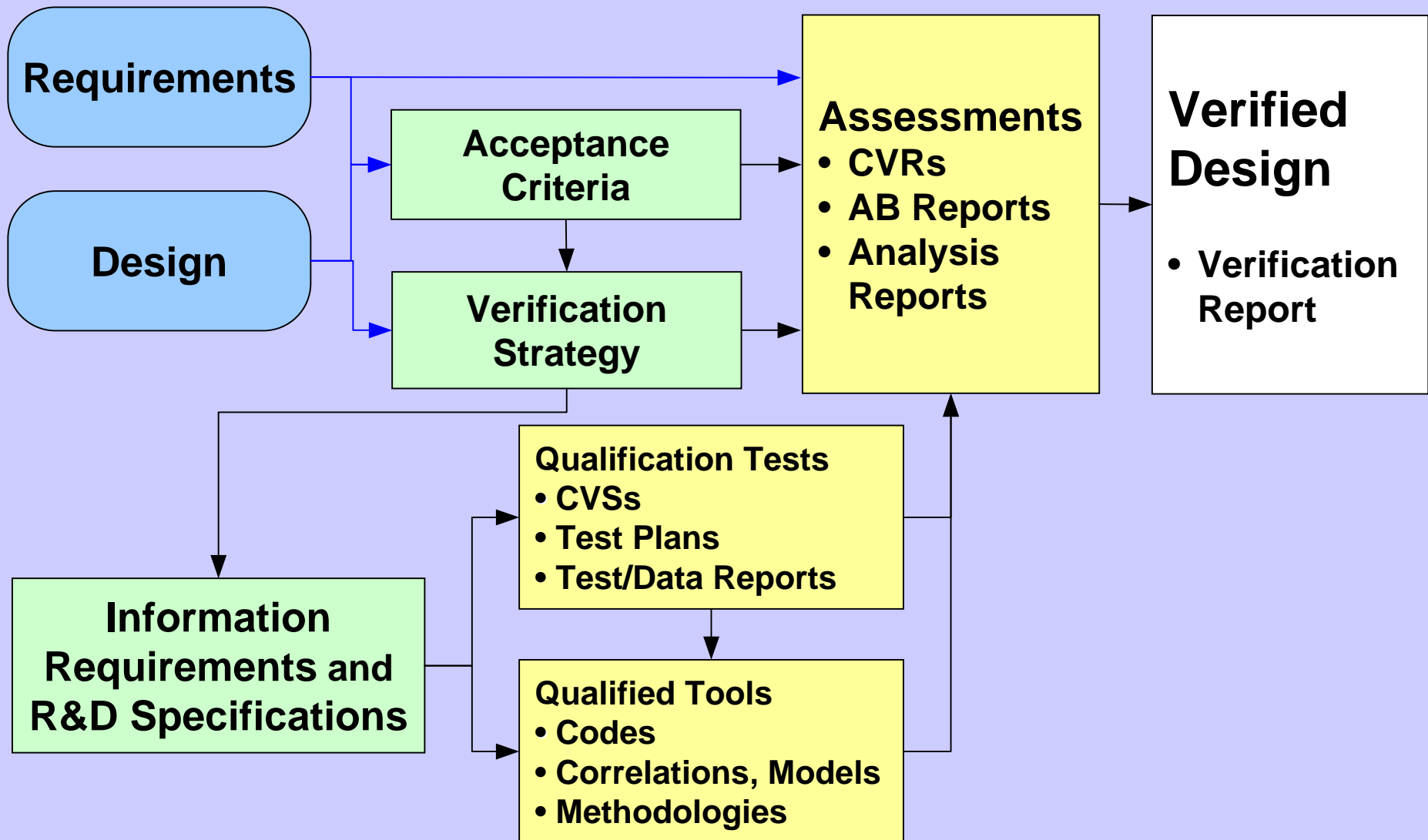
# Key Design Activities



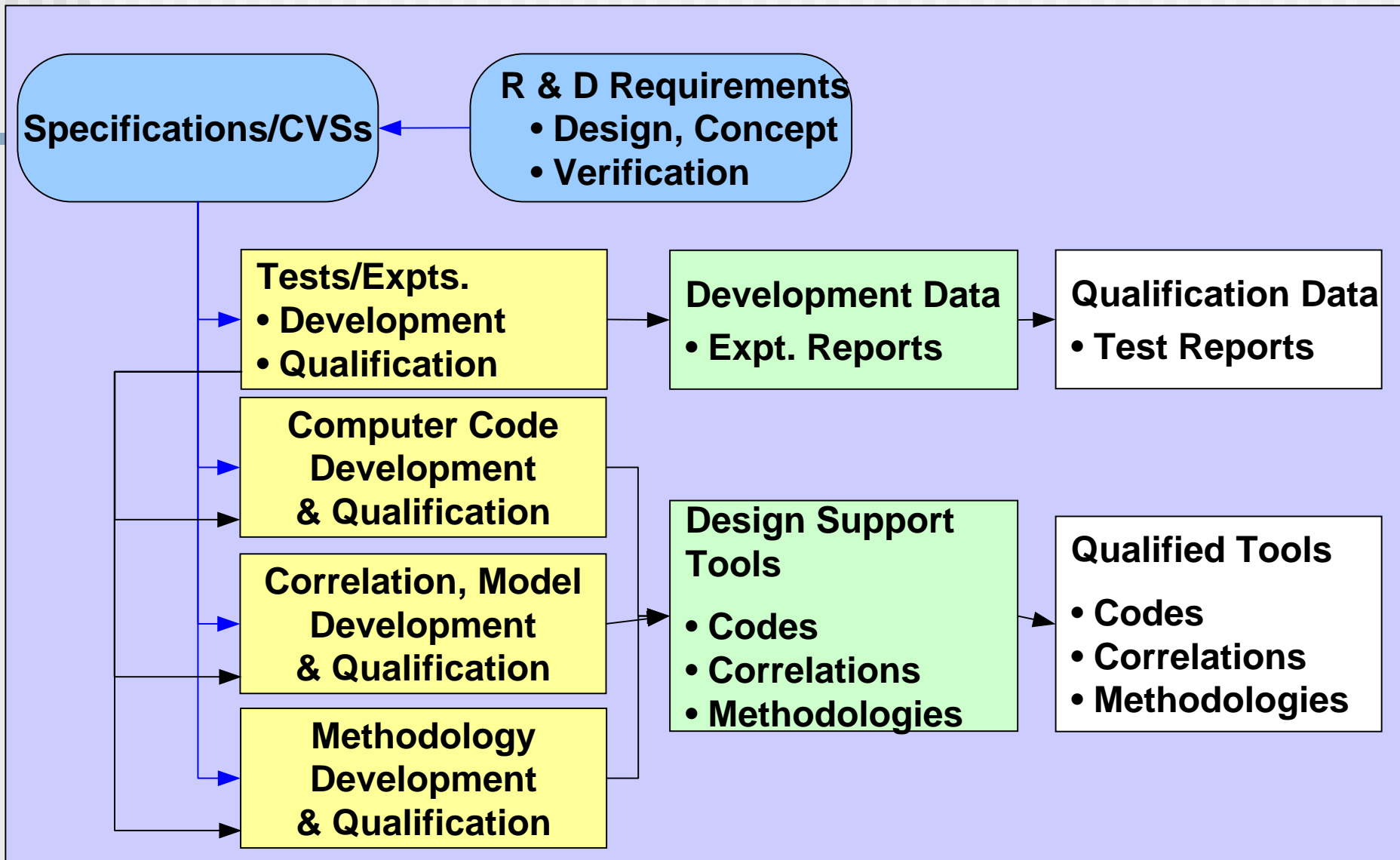
# Design Process



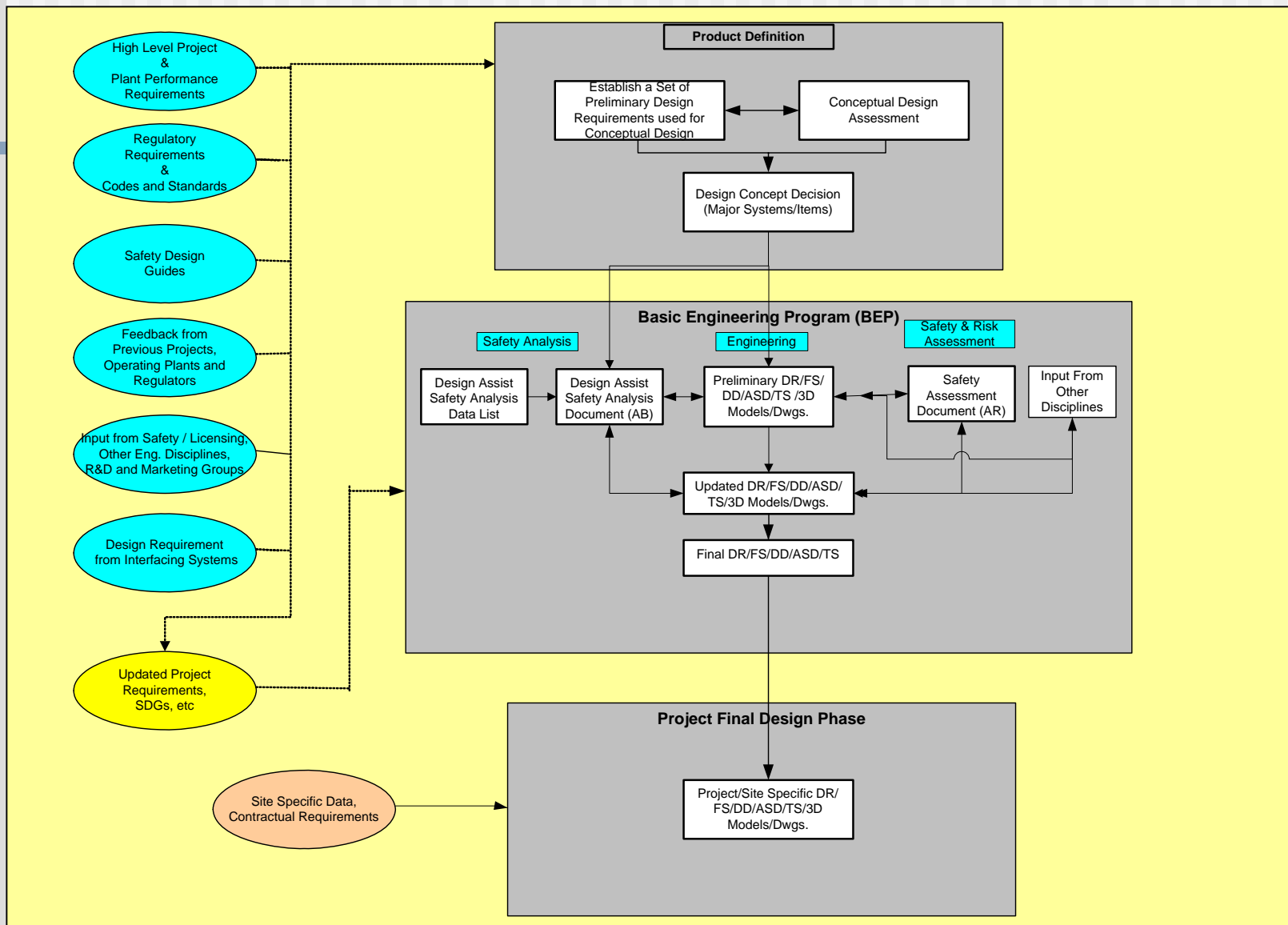
# Verification Process



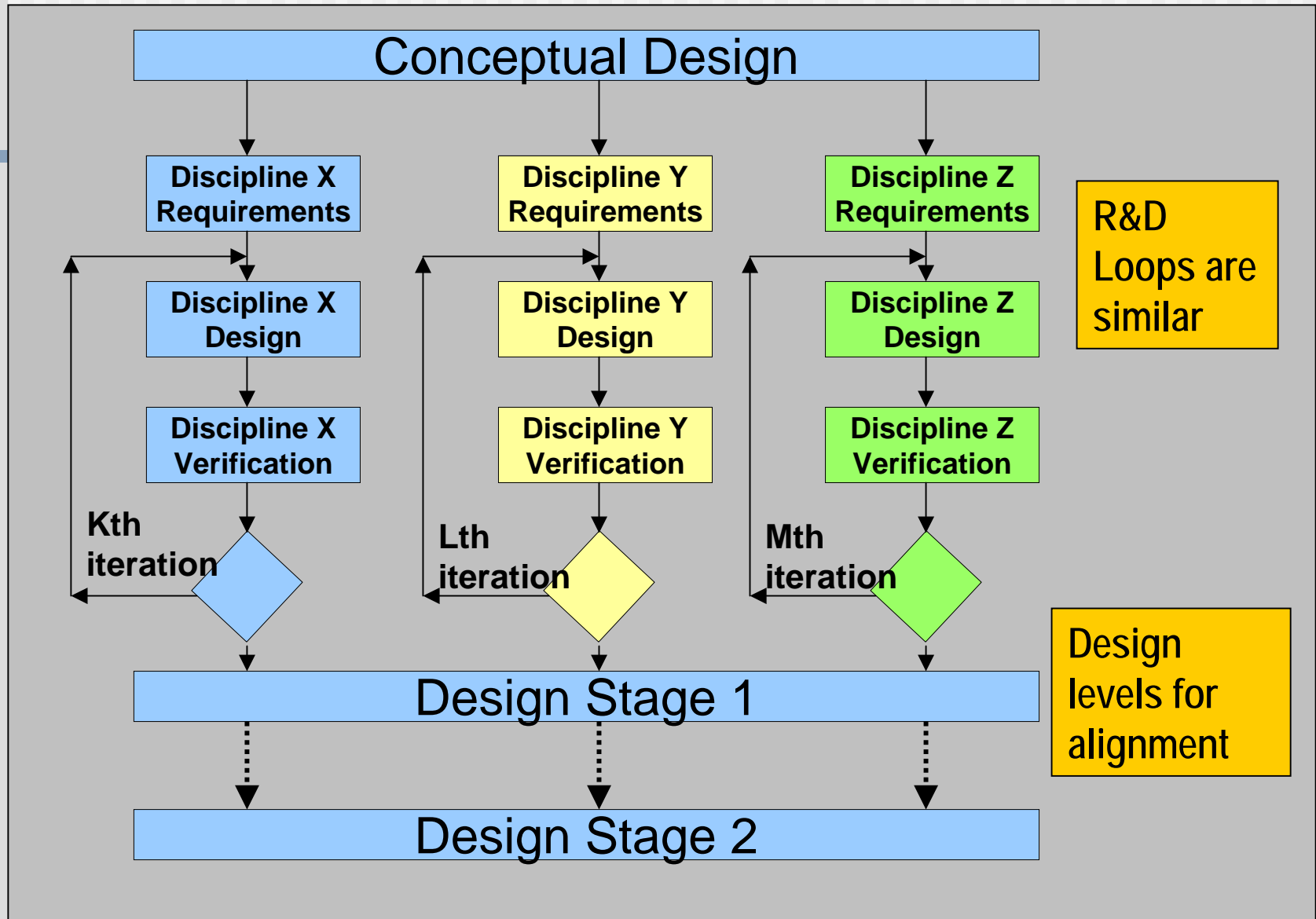
# R & D Process



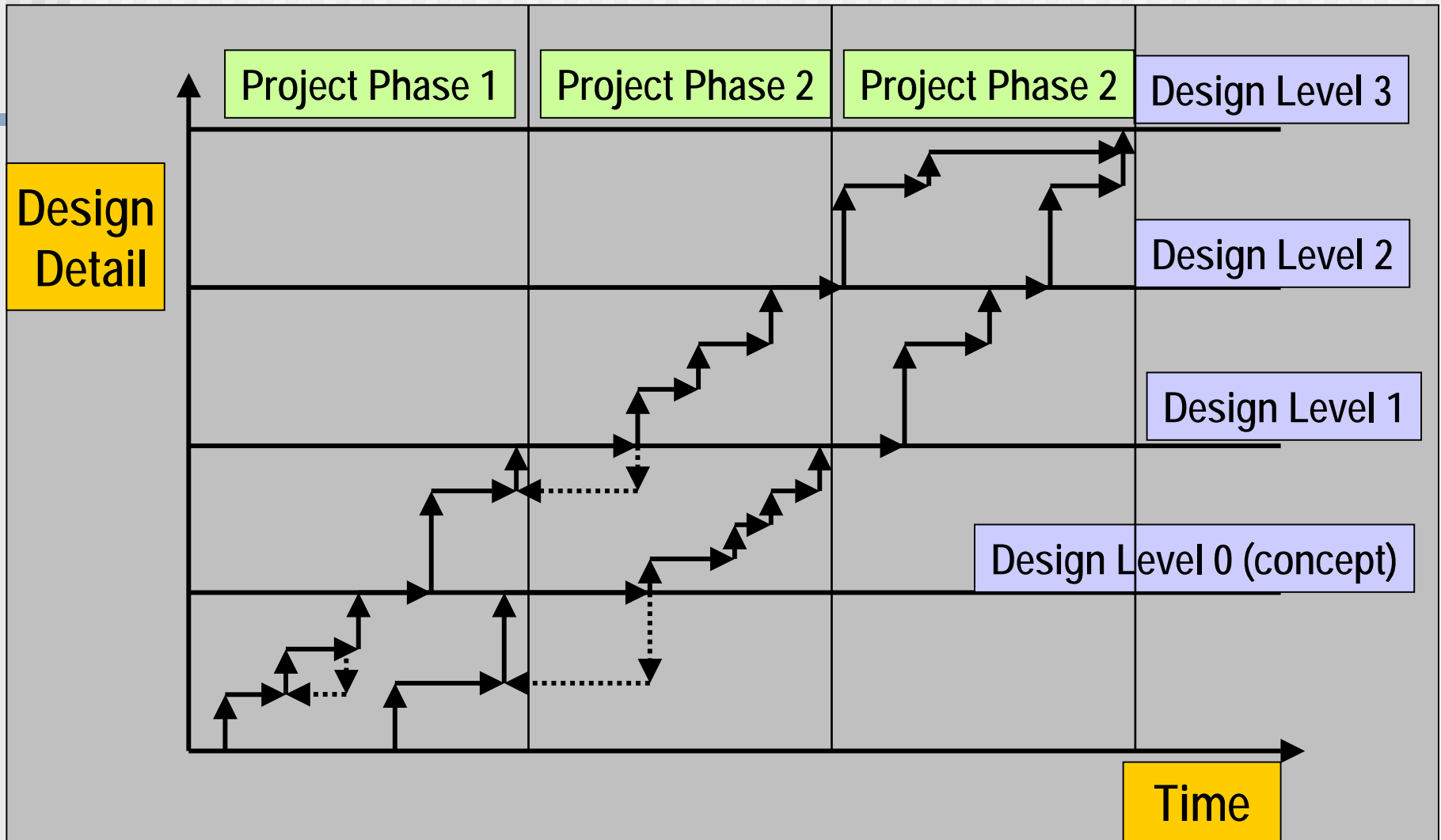
# Example of Process for Preparation of Design Documentation & Multidisciplinary Interfaces



# Design Iterative Process



# Design Process – Cascading Steps



# Questions?

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