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SUCCESS PATH METHOD AS A RECOMMENDED PRACTICE FOR ENHANCED QUALITY IN HIGH RELIABILITY ORGANIZATIONS

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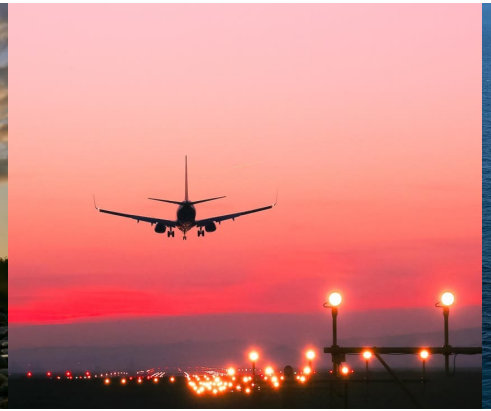
HIGH RELIABILITY ORGANIZATIONS

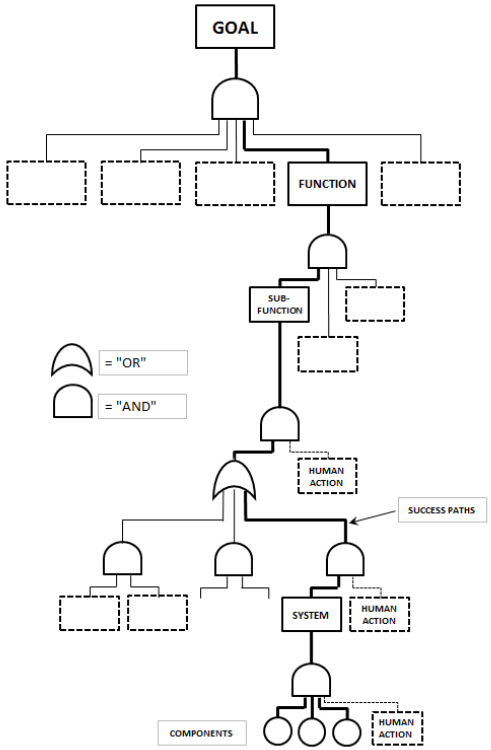
- Complex, high-risk organizations dealing in precise work at high level of performance
  - Need to stay vigilant and resilient against errors before cascading into accidents
- **1. Preoccupation with failure, 2. Reluctance to simplify, 3. Sensitivity to operations, 4. Commitment to resilience, 5. Deference to expertise**

SUCCESS PATH METHOD

- Since 2012, Argonne has worked with the U.S. Bureau of Safety and Environmental Enforcement (BSEE) to develop and implement tools that support risk-informed decision making
- Research report on Success Path Method notes:
  - Used to **visualize risk** in an easy-to-understand way
  - Provides a **common language** and **systematic process** for understanding and managing high-risk activities and equipment
  - Are an effective tool to **facilitate communication** and prioritize discussion topics among operators and BSEE with a **focus on improving safety**
  - Provide a consistent basis for documenting and defending decisions for a range of safety systems
  - Enable operational risk to be quantified

SUCCESS PATH METHOD

Use AND and OR gates to show critical items needed to succeed



- A ***success path*** is a diagram of the hardware, software, and human actions needed to ensure safe operation of a system or component
- Logic symbols are used to represent the different ways to meet a particular **objective** or goal – OR and AND gates indicate that any one or all items are needed in order to achieve success
- Success Paths provide a "chain of causality" illustrating what must go right to ensure safe operations

Visualizing what must go right helps us understand, manage, and respond to what can fail

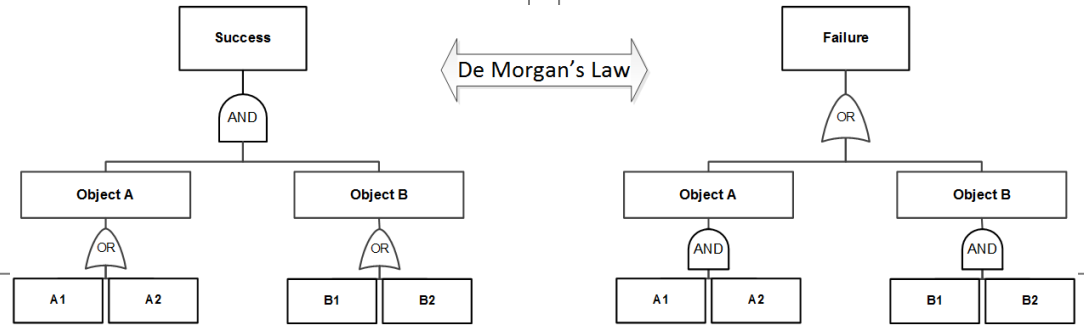
SUCCESS VS FAULT BASED ANALYSIS

SUCCESS-BASED

- Based on paths for system success
- Finite number of objects needed to succeed a pathway
- Aligns with how non-risk workers visualize things
  - Communicates system functionality and necessary pathways

FAILURE-BASED

- Based on potential failure modes
- Infinite ways to fail objects/systems
  - Requires detailed component fault analysis
- Often need risk engineers to interpret risk insights



SUCCESS PATH EXAMPLE FOR OIL & GAS OPERATIONS

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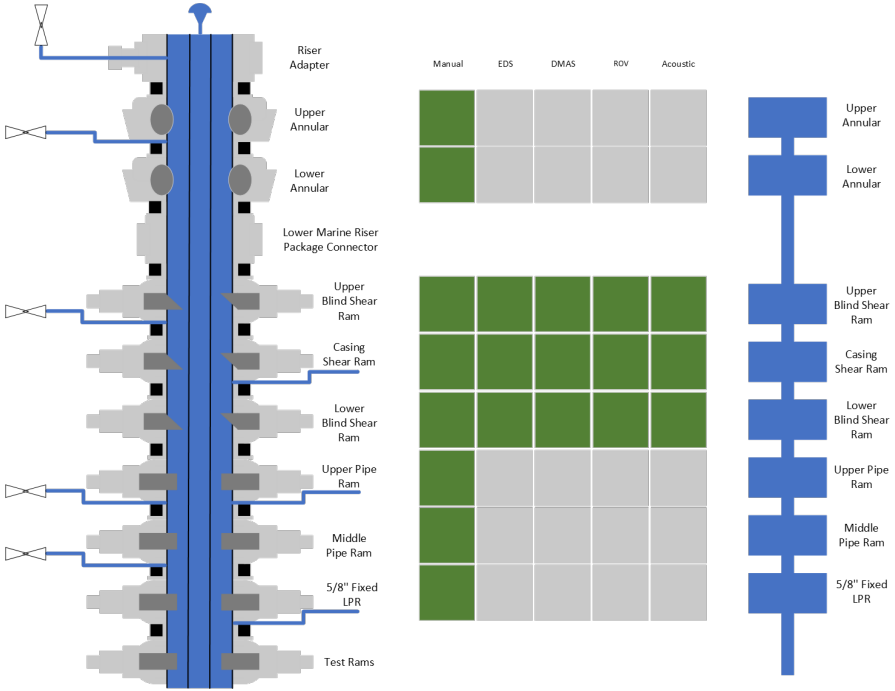
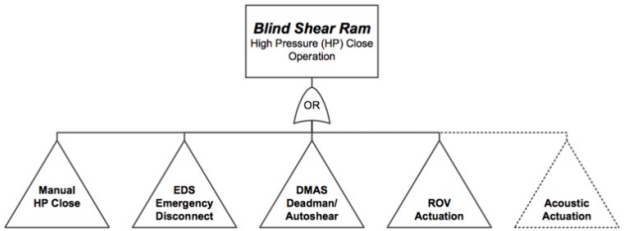
SUCCESS PATH ASSESSMENT OF BLOWOUT PREVENTER (BOP) SYSTEM RELIABILITY

BOP's blind shear ram high-pressure close operation



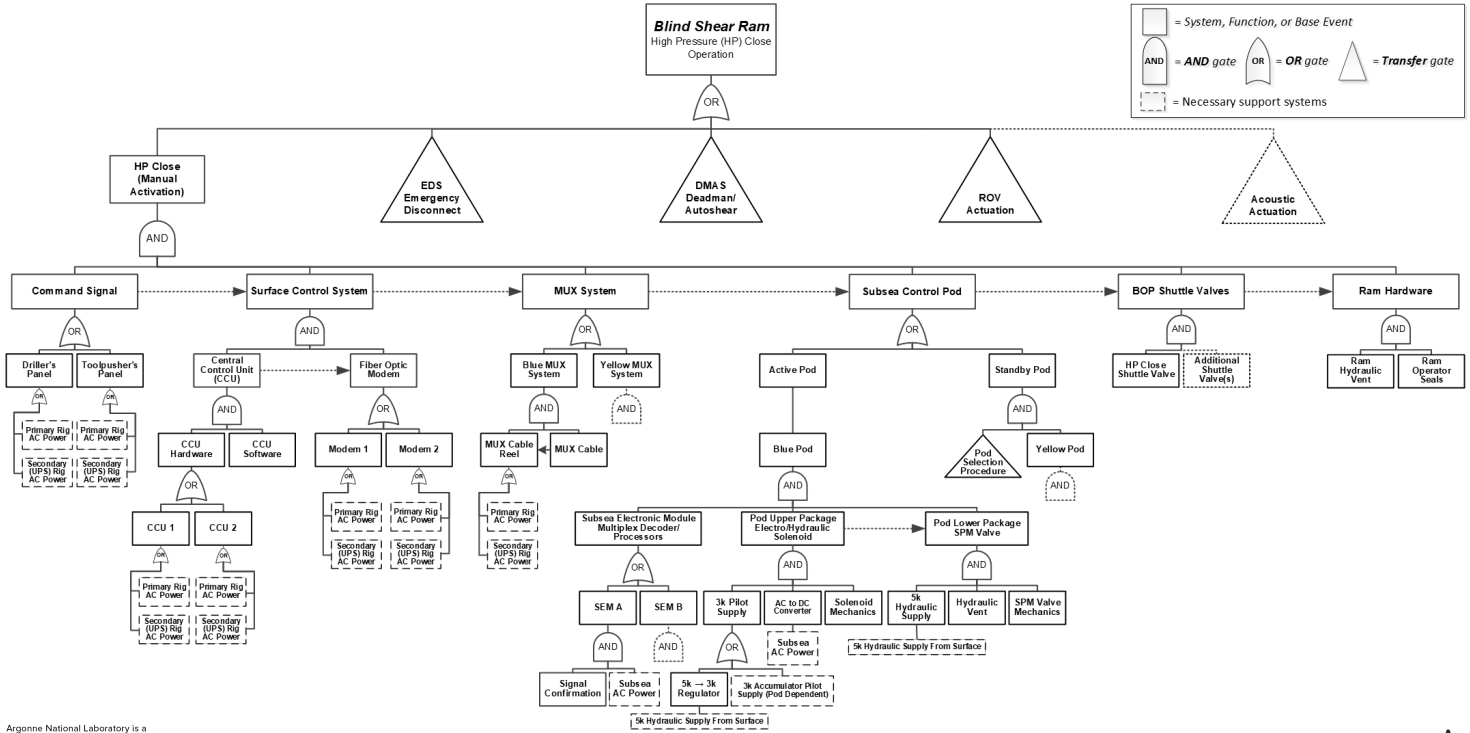
Actuation pathways for the **high-pressure (HP) close** function of the blind shear ram (BSR):

1. Manual HP Close
2. EDS Emergency Disconnect
3. DMAS Deadman/Autoshear
4. ROV Actuation
5. Acoustic Actuation



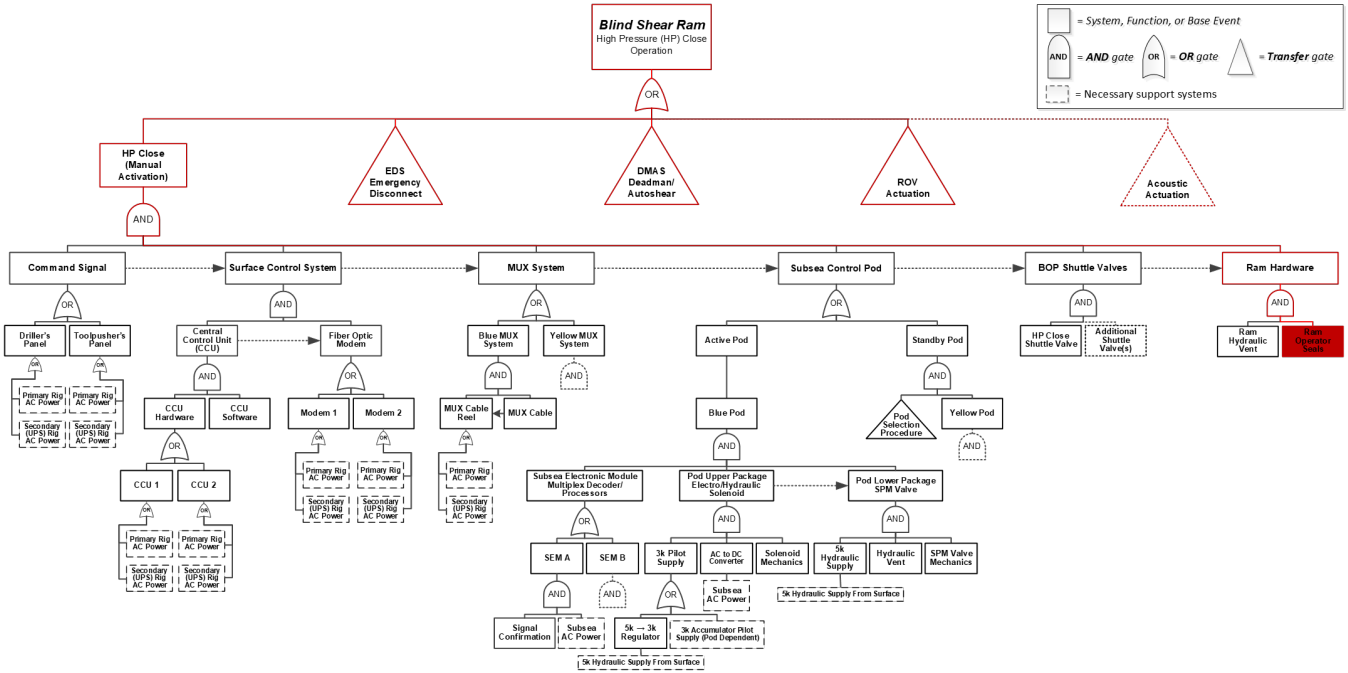
SUCCESS PATH ASSESSMENT OF THE BSR HP CLOSE OPERATION

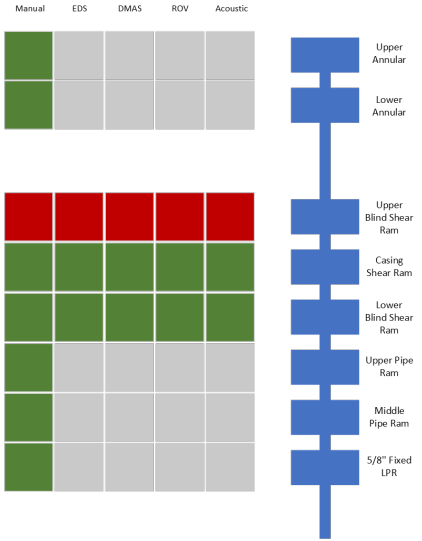
Success path diagram of the manual HP close operation



SUCCESS PATH METHOD EVALUATION OF WELL CONTROL EQUIPMENT FAILURE EVENTS

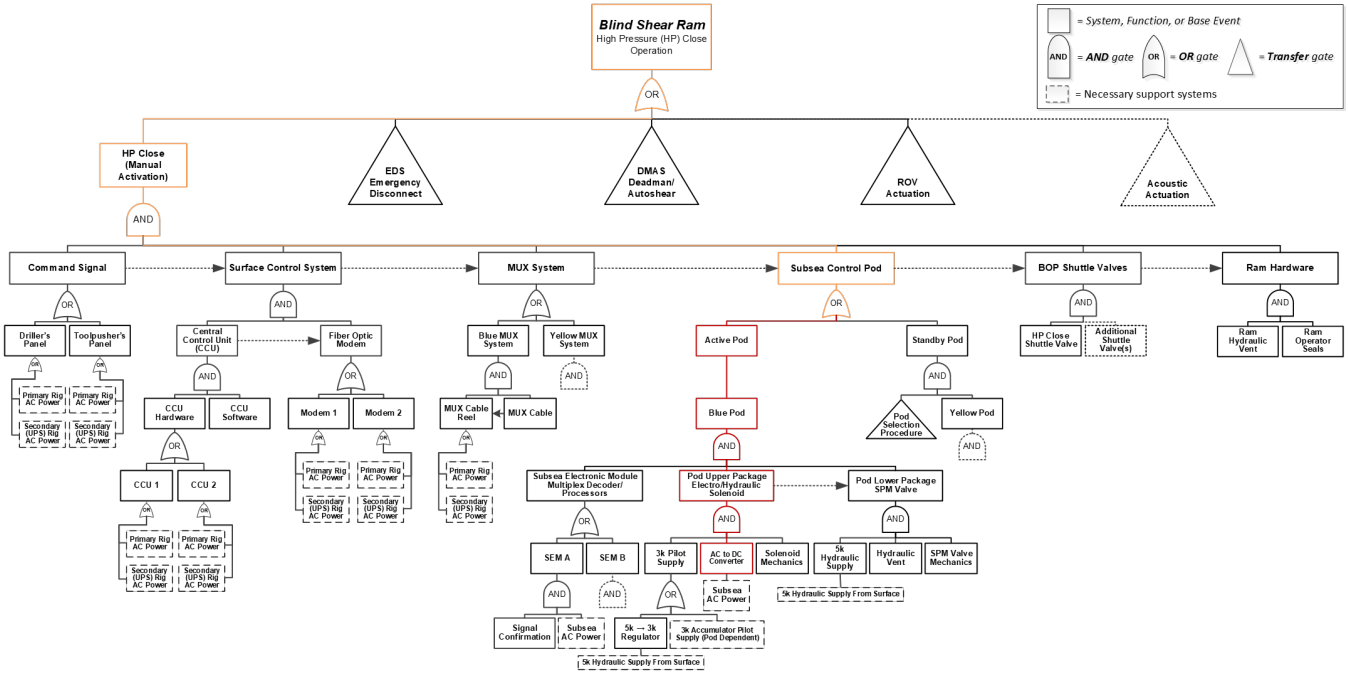
Failure of ram block seals





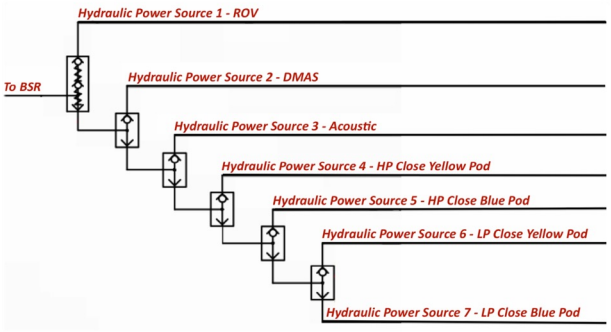
SUCCESS PATH METHOD EVALUATION OF WELL CONTROL EQUIPMENT FAILURE EVENTS

Failure of BOP control pods

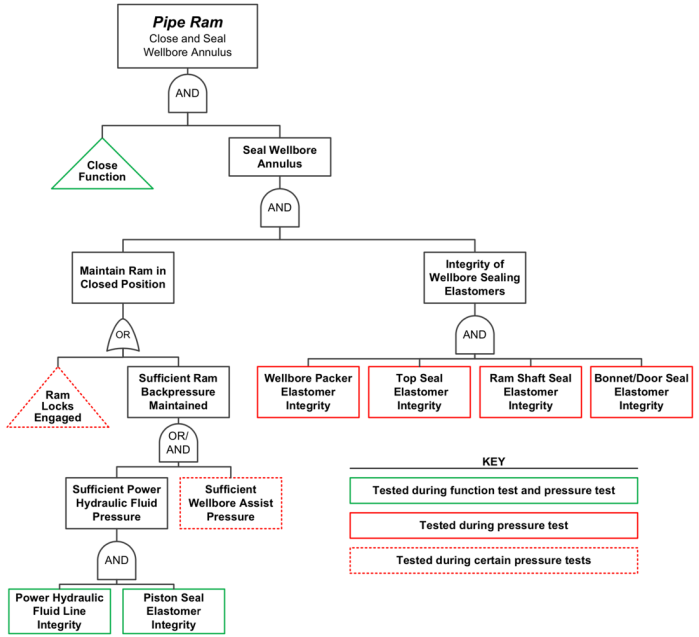


SUCCESS PATH – BLOWOUT PREVENTER (BOP)

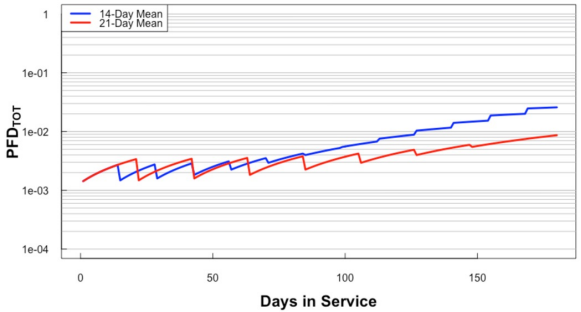
Multiple Applications



- Performed qualitative and quantitative analyses of reliability and identification of critical components



- Identification of components impacted by testing interval changes
- Assess potential changes in system reliability



GENERALIZATION OF THE SUCCESS PATH METHOD

GENERALIZING SUCCESS PATH METHOD

- Extend success path method used in BSEE work
  - To consider multiple challenges
  - To explicitly include probabilistic/risk calculations
  - To establish framework for use beyond safety analyses
- Conform to and embed ISO concepts and terminology
- Informed by
  - Staff expertise
    - Offshore oil safety and regulation
    - Commercial nuclear power plant risk and regulation
    - Health care patient safety
  - DHS risk management concepts and terminology

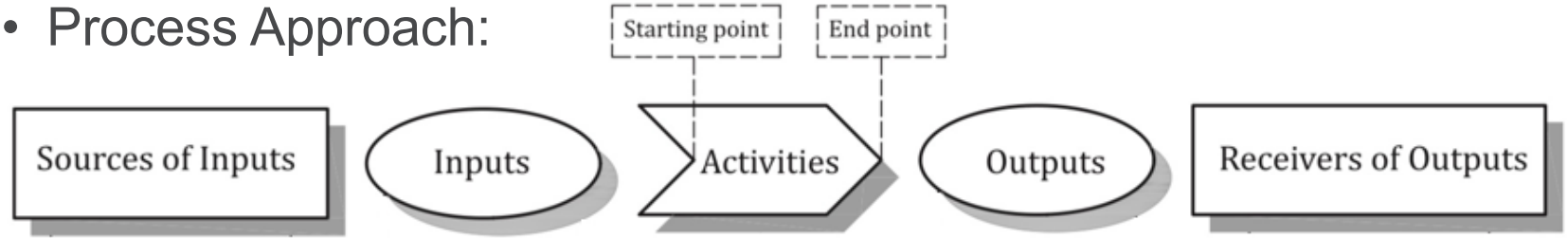
ISO 9000 – QUALITY MANAGEMENT SYSTEMS

- Internationally recognized standard for improving quality

ISO 9000 Seven Principles	*Customer Focus*
	Leadership
	Engagement of People
	Process Approach
	Improvement
	Evidence-based Decision Making
	Relationship Management

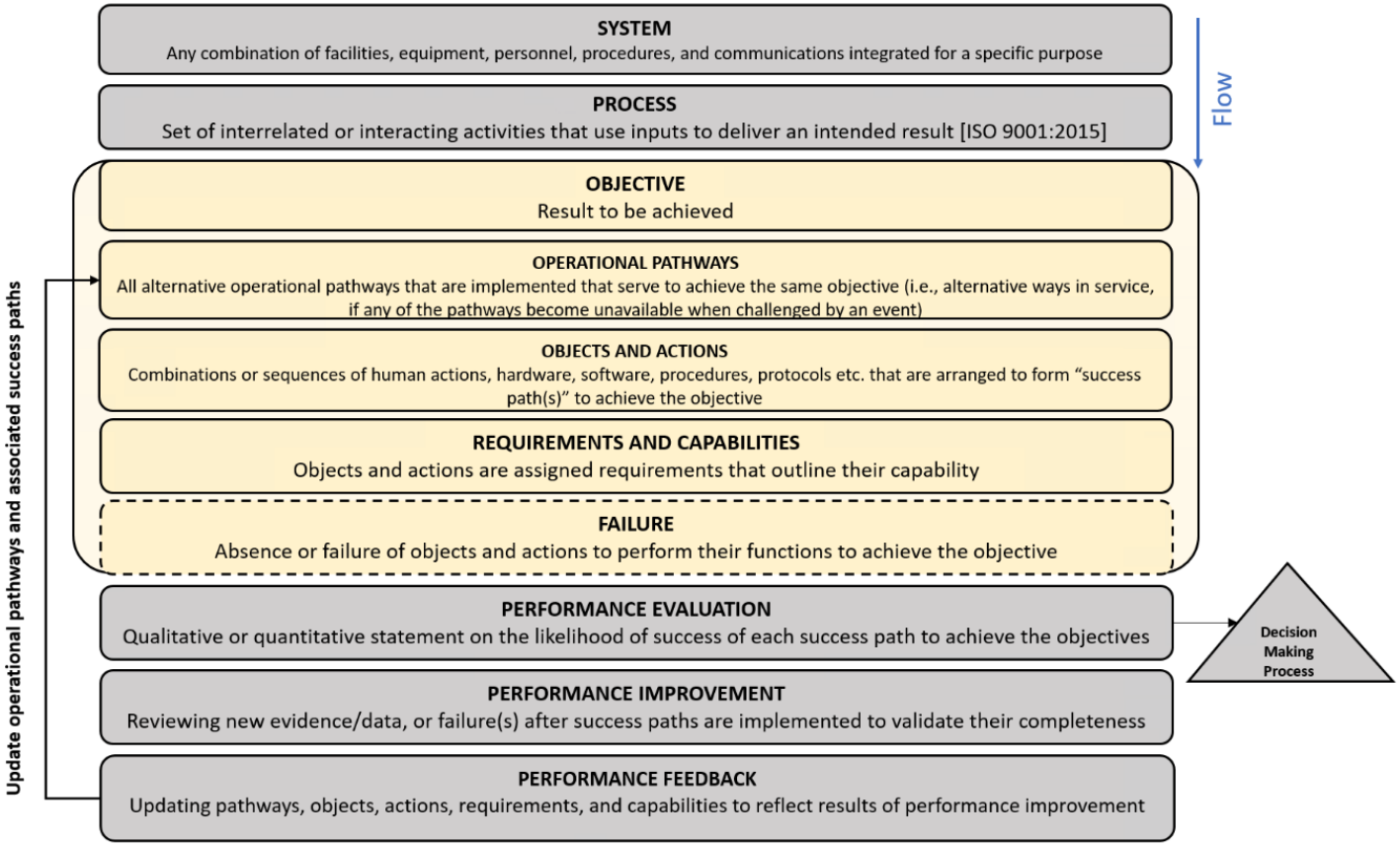
ISO 9001 – QUALITY MANAGEMENT SYSTEMS

- Process Approach:



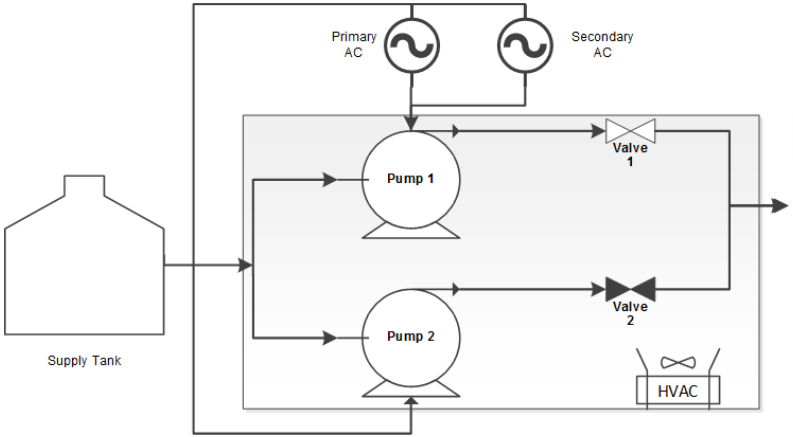
- Plan-Do-Check-Act Cycle:
  - **Plan**: Establish objectives, resources, risks, and opportunities
  - **Do**: Implement the plan
  - **Check**: Monitor, measure, and report
  - **Act**: Take actions to improve performance

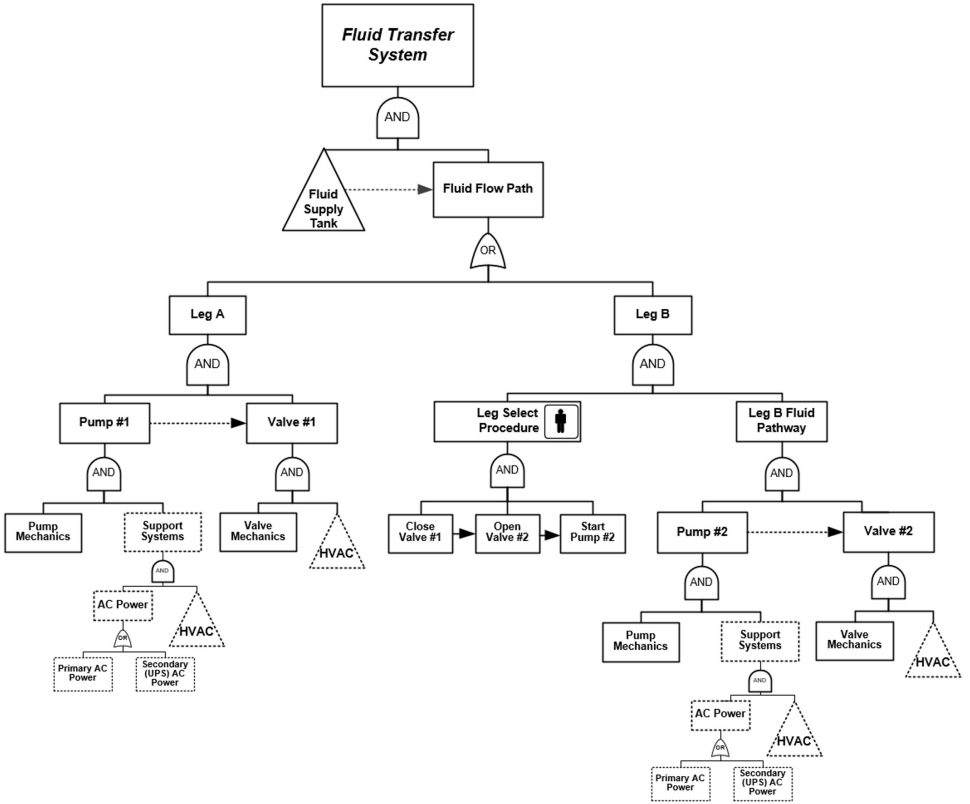
SUCCESS PATH METHOD - GENERALIZED



SUCCESS PATH DIAGRAM - GENERALIZED

Symbol	Name	Description
XXX	System, Group, Function or Base Event	Name of a system, group of functions, intermediate steps, or base event
AND	**AND** - Gate	**All** of the inputs are necessary for success
OR	**OR** - Gate	**Any** of the inputs are adequate for success
XXX	**Transfer** - Gate	Transfer to a different success path diagram
	Human Action	Requires human action or operation
	Actuation Progression	Indicates the order of progression for human actions or component actuation





NEXT STEPS

Next Steps

1. Draft Success Path Guidance Document
   - General Standard for Success Path Method

     (generalized set of steps and high-level requirements)
   - Report mapping Success Path Method to *ISO 9001 Quality management systems* standard
   - Guidance for Performing Success Path Analyses

     (how-to guide for identifying challenges and developing Success Paths)
2. Participate in ISO 9001 Working Group on Quality tools and their applications (ISO/TC 176/SC 3/WG 24)
   - New project ISO/AWI 10009 Quality management — Guidance for quality tools and their application; Under Development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