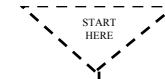


# Causal Analysis Tree Rev. 0



## A1 Design / Engineering Problem

- B1 DESIGN INPUT LTA
  - C01 Design input cannot be met
  - C02 Design input obsolete
  - C03 Design input not correct
  - C04 Necessary design input not available
- B2 DESIGN OUTPUT LTA
  - C01 Design output scope LTA
  - C02 Design output not clear
  - C03 Design output not correct
  - C04 Inconsistent design output
  - C05 Design input not addressed in design output
  - C06 Drawing, specification, or data error
  - C07 Error in equipment or material selection
  - C08 Errors not detectable
  - C09 Errors not recoverable
- B3 DESIGN / DOCUMENTATION LTA
  - C01 Design / documentation not complete
  - C02 Design / documentation not up-to-date
  - C03 Design / documentation not controlled
- B4 DESIGN / INSTALLATION VERIFICATION LTA
  - C01 Independent review of design / documentation LTA
  - C02 Testing of design / installation LTA
  - C03 Independent inspection of design / installation LTA
  - C04 Acceptance of design / installation LTA
- B5 OPERABILITY OF DESIGN / ENVIRONMENT LTA
  - C01 Ergonomics LTA
  - C02 Physical environment LTA
  - C03 Natural environment LTA

## A2 Equipment / Material Problem

- B1 CALIBRATION FOR INSTRUMENTS LTA
  - C01 Calibration LTA
  - C02 Equipment found outside acceptance criteria
- B2 PERIODIC / CORRECTIVE MAINTENANCE LTA
  - C01 Preventive maintenance for equipment LTA
  - C02 Predictive maintenance LTA
  - C03 Corrective maintenance LTA
  - C04 Equipment history LTA
- B3 INSPECTION / TESTING LTA
  - C01 Start-up testing LTA
  - C02 Inspection / testing LTA
  - C03 Post-maintenance / Post-modification testing LTA
- B4 MATERIAL CONTROL LTA
  - C01 Material handling LTA
  - C02 Material storage LTA
  - C03 Material packaging LTA
  - C04 Material shipping LTA
  - C05 Shelf life exceeded
  - C06 Unauthorized material substitution
  - C07 Marking / labeling LTA
- B5 PROCUREMENT CONTROL LTA
  - C01 Control of changes to procurement specifications / purchase order LTA
  - C02 Fabricated item did not meet requirements
  - C03 Incorrect item received
  - C04 Product acceptance requirements LTA
- B6 DEFECTIVE, FAILED OR CONTAMINATED
  - C01 Defective or failed part
  - C02 Defective or failed material
  - C03 Defective weld, braze or soldering joint
  - C04 End of life failure
  - C05 Electrical or instrument noise
  - C06 Contaminant

## A3 Human Performance LTA

- B1 SKILL BASED ERROR
  - C01 Check of work was LTA
  - C02 Step was omitted due to distraction
  - C03 Incorrect performance due to mental lapse
  - C04 Infrequently performed steps were performed incorrectly
  - C05 Delay in time caused LTA actions
  - C06 Wrong action selected based on similarity with other actions
  - C07 Omission / repeating of steps due to assumptions for completion
- B2 RULE BASED ERROR
  - C01 Strong rule incorrectly chosen over other rules
  - C02 Signs to stop were ignored and step performed incorrectly
  - C03 Too much activity was occurring and error made in problem solving
  - C04 Previous success in use of rule reinforced continued use of rule
  - C05 Situation incorrectly identified or represented resulting in wrong rule used
- B3 KNOWLEDGE BASED ERROR
  - C01 Attention was given to wrong issues
  - C02 LTA conclusion based on sequencing of facts
  - C03 Individual justified action by focusing on biased evidence
  - C04 LTA review based on assumption that process will not change
  - C05 Incorrect assumption that a correlation existed between two or more facts
  - C06 Individual underestimated the problem by using past events as basis
- B4 WORK PRACTICES LTA
  - C01 Individual's capability to perform work LTA [Examples include: Sensory / perceptual capabilities LTA, Motor / physical capabilities LTA, and Attitude / psychological profile LTA.]
  - C02 Deliberate violation

## A4 Management Problem

- B1 MANAGEMENT METHODS LTA
  - C01 Management policy guidance / expectations not well-defined, understood or enforced
  - C02 Job performance standards not adequately defined
  - C03 Management direction created insufficient awareness of impact of actions on safety / reliability
  - C04 Management follow-up or monitoring of activities did not identify problems
  - C05 Management assessment did not determine causes of previous event or known problem
  - C06 Previous industry or in-house experience was not effectively used to prevent recurrence
  - C07 Responsibility of personnel not well-defined or personnel not held accountable
  - C08 Corrective action responses to a known or repetitive problem was untimely
  - C09 Corrective action for previously identified problem or event was not adequate to prevent recurrence
- B2 RESOURCE MANAGEMENT LTA
  - C01 Too many administrative duties assigned to immediate supervisor
  - C02 Insufficient supervisory resources to provide necessary supervision
  - C03 Insufficient manpower to support identified goal / objective
  - C04 Resources not provided to assure adequate training was provided / maintained
  - C05 Needed resource changes not approved / funded
  - C06 Means not provided to assure procedures / documents / records were of adequate quality and up-to-date
  - C07 Means not provided for assuring adequate availability of appropriate materials / tools
  - C08 Means not provided for assuring adequate equipment quality, reliability, or operability
  - C09 Personnel selection did not assure match of worker motivations / job descriptions
  - C10 Means / method not provided for assuring adequate quality of contract services

- B3 WORK ORGANIZATION & PLANNING LTA
  - C01 Insufficient time for worker to prepare task
  - C02 Insufficient time allotted for task
  - C03 Duties not well-distributed among personnel
  - C04 Too few workers assigned to task
  - C05 Insufficient number of trained or experienced workers assigned to task
  - C06 Planning not coordinated with inputs from walkdowns / task analysis
  - C07 Job scoping did not identify potential task interruptions and / or environmental stress
  - C08 Job scoping did not identify special circumstances and / or conditions
  - C09 Work planning not coordinated with all departments involved in task
  - C10 Problem performing repetitive tasks and / or subtasks
  - C11 Inadequate work package preparation
- B4 SUPERVISORY METHODS LTA
  - C01 Tasks and individual accountability not made clear to worker
  - C02 Progress / status of task not adequately tracked
  - C03 Appropriate level of in-task supervision not determined prior to task
  - C04 Direct supervisory involvement in task interfered with overview role
  - C05 Emphasis on schedule exceeded emphasis on methods / doing a good job
  - C06 Job performance and self-checking standards not properly communicated
  - C07 Too many concurrent tasks assigned to worker
  - C08 Frequent job or task "shuffling"
  - C09 Assignment did not consider worker's need to use higher-order skills
  - C10 Assignment did not consider worker's previous task
  - C11 Assignment did not consider worker's ingrained work patterns
  - C12 Contact with personnel too infrequent to detect work habit / attitude changes
  - C13 Provided feedback on negative performance but not on positive performance
- B5 CHANGE MANAGEMENT LTA
  - C01 Problem identification did not identify need for change
  - C02 Change not implemented in timely manner
  - C03 Inadequate vendor support of change
  - C04 Risks / consequences associated with change not adequately reviewed / assessed
  - C05 System interactions not considered
  - C06 Personnel / department interactions not considered
  - C07 Effects of change on schedules not adequately addressed
  - C08 Change-related training / retraining not performed or not adequate
  - C09 Change-related documents not developed or revised
  - C10 Change-related equipment not provided or not revised
  - C11 Changes not adequately communicated
  - C12 Change not identifiable during task
  - C13 Accuracy / effectiveness of change not verified or not validated

## A5 Communications LTA

- B1 WRITTEN COMMUNICATIONS METHOD OF PRESENTATION LTA
  - C01 Format deficiencies
  - C02 Improper referencing or branching
  - C03 Checklist LTA
  - C04 Deficiencies in user aids (charts, etc.)
  - C05 Recent changes not made apparent to user
  - C06 Instruction step / information in wrong sequence
  - C07 Unclear / complex wording or grammar
- B2 WRITTEN COMMUNICATION CONTENT LTA
  - C01 Limit inaccuracies
  - C02 Difficult to implement
  - C03 Data / computations wrong / incomplete
  - C04 Equipment identification LTA
  - C05 Ambiguous instructions/ requirements
  - C06 Typographical error
  - C07 Facts wrong / requirements not correct
  - C08 Incomplete / situation not covered
  - C09 Wrong revision used
- B3 WRITTEN COMMUNICATION NOT USED
  - C01 Lack of written communication
  - C02 Not available or inconvenient for use
- B4 VERBAL COMMUNICATION LTA
  - C01 Communication between work groups LTA
  - C02 Shift communications LTA
  - C03 Correct terminology not used
  - C04 Verification / repeat back not used
  - C05 Information sent but not understood
  - C06 Suspected problems not communicated to supervision
  - C07 No communication method available

## A6 Training Deficiency

- B1 NO TRAINING PROVIDED
  - C01 Decision not to train
  - C02 Training requirements not identified
  - C03 Work incorrectly considered "skill of the craft"
- B2 TRAINING METHODS LTA
  - C01 Practice or hands-on experience LTA
  - C02 Testing LTA
  - C03 Refresher training LTA
  - C04 Inadequate presentation
- B3 TRAINING MATERIAL LTA
  - C01 Training objectives LTA
  - C02 Inadequate content
  - C03 Training on new work methods LTA
  - C04 Performance standards LTA
- A7 Other Problem**
  - B1 EXTERNAL PHENOMENA
    - C01 Weather or ambient conditions LTA
    - C02 Power failure or transient
    - C03 External fire or explosion
    - C04 Other natural phenomena LTA
  - B2 RADIOLOGICAL / HAZARDOUS MATERIAL PROBLEM
    - C01 Legacy contamination
    - C02 Source unknown

Level A nodes are underlined.  
 Level B nodes are in ALLCAPS.  
 Level C nodes are in "sentence case."  
 LTA = Less than adequate