A1 Design / Engineering Problem
A2 Equipment / Material Problem
A3 Human Performance LTA
A4 Management Problem
A5 Communication LTA
A6 Training Deficiency

ATTACHMENT 1. CAUSAL ANALYSIS TREE REV. 1

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 change
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 solution
C08 Error not detectable
C09 Errors not recoverable

B3 DESIGN/DOCUMENTATION LTA
C01 Design/documentation not complete LTA
C02 Design/documentation not up-to-date LTA
C03 Design/documentation not controlled LTA

B4 DESIGN/INSTALLATION VERIFICATION LTA
C01 Independent review of design/documentation LTA
C02 Testing of design/installation
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

B6 CALIBRATION FOR INSTRUMENTS LTA
C01 Calibration LTA
C02 Equipment found outside acceptance criteria

B7 PERIODIC / CORRECTIVE MAINTENANCE LTA
C01 Preventive maintenance for equipment LTA
C02 Predictive maintenance LTA
C03 Corrective maintenance LTA
C04 Equipment history LTA

B8 INSTRUCTION/TESTING LTA
C01 Start-up testing LTA
C02 Inspection/testing LTA
C03 Post-maintenance/post modification testing LTA

B9 MATERIAL CONTROL LTA
C01 Material handling LTA
C02 Material storage LTA
C03 Material packaging LTA
C04 Material shipping LTA
C05 Shelf-life exceeded
C06 Unsanitized material submittal
C07 Marking/labeling LTA

B10 PROCEDURE CONTROL LTA
C01 Control of changes to procurement specifications / work instruction LTA
C02 Fabricated item not meet requirements
C03 Incorrect item received
C04 Product acceptance requirements LTA

B11 DEFECTIVE OR FAILED CONTAMINATED
C01 Defective or failed part
C02 Defective or failed material
C03 Defective weld, Brazed or fusion joint
C04 End of life failure
C05 Electrical or instrument noise
C06 Contamination

B12 MANUFACTURING METHODS LTA
C01 Calibration was not performed
C02 Step was omitted due to mental lapse
C03 Incorrect performance due to mental lapse
C04 Incomplete performance due to physical mishandling
C05 Omission or repetition of steps due to assumptions for completion

B13 RULE BASED ERROR
C01 Strong rule correctly identified or reviewed by rule
C02 Signs to stop were ignored and step performed incorrectly
C03 Too much activity was occurring and error made in problem solving
C04 Previous access in use of rule reinforced continuation use of rule
C05 Situation incorrectly identified or represented in written rule usage

B14 KNOWLEDGE BASED ERROR
C01 Attention was given to wrong issues
C02 Causal conclusion based on sequencing of facts
C03 Individual not justified action by focusing on biased evidence
C04 LTA review based on assumption that process will work
C05 Incorrect assumption that a correlation existed between two or more facts
C06 Individual underestimated the problem by using past event as basis

B15 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

B16 MANAGEMENT METHODS LTA
C01 Management policy guidance/expectations not well-defined, un-enforced or un-enforced
C02 Inadequate training or experienced workers assigned to task
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

B17 CHANGE MANAGEMENT LTA
C01 Problem identification did not identify need for change
C02 Change not implemented in a 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

B18 VERBAL COMMUNICATION LTA
C01 Communication between work groups LTA
C02 Shift communications LTA
C03 Technical terminology not used
C04 Verification/repeat back not used
C05 Information sent but not understood

B19 WRITTEN COMMUNICATION LTA
C01 Format deficiencies
C02 Inadequate referencing or branching
C03 Checklist LTA
C04 Deficiencies in user aids (charts, etc.)
C05 Recent changes not made apparent to user
C06 Instruction step’s/information in wrong sequence

C07 Unclear/complex wording or grammar

B20 EQUIPMENT/CONTENT LTA
C01 Limit inaccuracies
C02 Difficult to implement
C03 Data/computations wrong/incomplete
C04 Equipment identification LTA
C05 Ambiguous instructions/requirements

C06 Previous industry or in-house experience was not effectively utilized
C07 Responsibility of personal not well-defined or personal not held accountable

C08 Corrective action responses to a known or repetitive problem was uncertain
C09 Corrective actions for previously identified problem or event was not adequate to prevent recurrence

B21 RULE BASED ERROR
C01 Strong rule incorrectly identified or reviewed by rule
C02 Signs to stop were ignored and step performed incorrectly
C03 Too much activity was occurring and error made in problem solving
C04 Previous access in use of rule reinforced continuation use of rule
C05 Situation incorrectly identified or represented in written rule usage

B22 KNOWLEDGE BASED ERROR
C01 Attention was given to wrong issues
C02 Causal conclusion based on sequencing of facts
C03 Individual not justified action by focusing on biased evidence
C04 LTA review based on assumption that process will work
C05 Incorrect assumption that a correlation existed between two or more facts
C06 Individual underestimated the problem by using past event as basis

B23 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

B24 MANAGEMENT METHODS LTA
C01 Management policy guidance/expectations not well-defined, un-enforced or un-enforced
C02 Inadequate training or experienced workers assigned to task
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

B25 CHANGE MANAGEMENT LTA
C01 Problem identification did not identify need for change
C02 Change not implemented in a 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

B26 VERBAL COMMUNICATION LTA
C01 Communication between work groups LTA
C02 Shift communications LTA
C03 Technical terminology not used
C04 Verification/repeat back not used
C05 Information sent but not understood

C06 Recent changes not made apparent to user
C07 Instruction step’s/information in wrong sequence

C08 Unclear/complex wording or grammar

B27 WRITTEN COMMUNICATION LTA
C01 Form deficiencies
C02 Inadequate referencing or branching
C03 Checklist LTA
C04 Deficiencies in user aids (charts, etc.)
C05 Recent changes not made apparent to user
C06 Instruction step’s/information in wrong sequence

C07 Unclear/complex wording or grammar