

DNV GL – Marine Systematic Cause Analysis Technique (M-SCAT 8.2)

TYPE OF LOSS		DESCRIPTION OF EVENT	
<input type="checkbox"/> People (Safety/Health)	<input type="checkbox"/> Non-Conformity (Product/Service)		
<input type="checkbox"/> Asset (Damage)	<input type="checkbox"/> Reputation/Complaint		
<input type="checkbox"/> Environmental	<input type="checkbox"/> Process/Business		
<input type="checkbox"/> Financial (Fines, Claims, Insurance)			

RISK EVALUATION

A risk evaluation of the event is required based on an analysis of the consequence potential and the probability/frequency of the event recurring by a competent individual against defined evaluation criteria. The risk evaluation is used to assess the significance of the event relative to others and prioritise the implementation of improvement actions.

TYPE OF EVENT		
1. Fall from Elevation (Person/Equipment/Material)	8. Exposure to Noise	14. Ship Grounding
2. Fall on Same Level (Slip and Fall/Trip Over)	9. Exposure to Vibration	15. Ship Contact Damage (Docks, Locks, Buoys, etc.)
3. Struck against (bump into / run into)	10. Exposure to Radiation	16. Fire
4. Struck By (Hit By Moving Object)	11. Contact with Hazardous Substance/Dose (Toxic/Corrosive/ Carcinogenic/ Biological/Viral)	17. Explosion
5. Caught In, On, Between or Under	12. Overstress by Overexertion, Overload, Ergonomic Factors	18. Loss of Ship Hull/Watertight Integrity
6. Contact with Temperature Extremes (Heat/Cold)	13. Ship Collision	19. Failure of Mechanical Equipment
7. Contact with Electricity		20. Failure of Electrical System
		21. Failure of Instrumentation/Logic/Loop
		22. Cargo Damage and/or Loss
		23. Environmental Release (to Air/Water/Soil)
		24. Loss of Ship Stability
		25. Customers/Stakeholders Complaints
		26. Act of Violence

IMMEDIATE CAUSES – SUBSTANDARD ACTS		
1. Under the Influence of Medicine/Alcohol/Drugs	8. Improper Placement	15. Inadequate Servicing of Equipment/Machinery in Operation
2. Failure to Follow Procedure/Instruction	9. Improper Position for Task	16. Using Defective Tool/Equipment/Machinery/Device
3. Failure to Secure	10. Incorrect Navigation or Ship Handling	17. Improper Operation of Tool/Equipment/Machinery/Device
4. Failing to Use Personal Protective Equipment Properly	11. Making Safety Devices Inoperable	18. Foul Play/Sabotage
5. Failure to Inform/Warn	12. Operating at Improper Speed	19. Substandard Act by External Party (Not Under Own Control)
6. Improper Lifting	13. Operating Equipment Without Authority	19.1 Pilots
7. Improper Loading	14. Removing Safety Devices	19.2 Boatmen
		19.3 Terminal Personnel
		19.4 Local Authorities
		19.5 Incorrect Supply of Documents/Information
		19.6 Other External Party Not Under The Control of The Company/Shipboard Management
		20. Failure to Comply with Customers/Stakeholders Requirements
		21. Civil Disturbance (Riot, Unrest, Warfare)
		22. Criminal Activities

IMMEDIATE CAUSES – SUBSTANDARD CONDITIONS		
23. Cargo	30. Exposure to Low Temperature	37. Inadequate/Improper Personal Protective Equipment
24. Congestion/Restricted Space for Action	31. Noise Level Over Threshold	38. Inadequate Ventilation
25. Defective Tool/Equipment	32. Radiation Hazard Over Threshold	39. Inadequate Warning Systems
26. Incorrect Material	33. Presence of Flammable/Explosive Atmosphere	40. Incorrect/Inadequate Tool/Equipment
27. Electric Current Hazards	34. Exposure to Dangerous Atmosphere Causing Suffocation or Poisoning	41. Outdated Charts, Publications and Other Documentation
28. Exposure to Chemicals	35. Inadequate Guard/Barrier	42. Poor Housekeeping/Order
29. Exposure to High Temperature	36. Insufficient/Excessive Illumination	43. Inadequate Condition of Floor/Surface
		44. Exposure to Adverse Weather Condition
		45. Extreme Adverse Sea Conditions
		46. Inadequate Port and Berthing Facilities

BASIC CAUSES – PERSONAL FACTORS		
1. Inadequate Physical/Physiological Capability	2.8. Low mechanical aptitude	4.5. Extreme concentration/perception demands
1.1. Inappropriate height/weight/size/strength/reach, etc.	2.9. Low learning aptitude	4.6. Meaningless/degrading activities
1.2. Restricted range of body movement	2.10. Memory failure/lapse	4.7. Confusing directions/demands
1.3. Limited ability/inability to sustain body positions	3. Physical/Physiological Stress	4.8. Conflicting demands/directions
1.4. Substance sensitivity/allergy	3.1. Injury or illness	4.9. Preoccupation with problems/Distracted by concern
1.5. Sensitivities to sensory extreme (temperature/sound/etc.)	3.2. Fatigue due to task load or duration	4.10. Frustration
1.6. Vision deficiency	3.3. Fatigue due to lack of rest	4.11. Mental illness
1.7. Hearing deficiency	3.4. Fatigue due to sensory overload	5. Lack of Competence
1.8. Other sensory deficiency (touch/taste/smell/balance)	3.5. Exposure to health hazard	5.1. Inadequate experience
1.9. Respiratory incapacity	3.6. Exposure to temperature extreme	5.2. Inadequate orientation/induction
1.10. Other permanent physical disability	3.7. Oxygen deficiency	5.3. Inadequate initial training
1.11. Temporary disability	3.8. Atmospheric pressure variation	5.4. Inadequate update/refresher training
2. Inadequate Mental/Psychological Capability	3.9. Constrained movement	5.5. Misunderstood instruction/information
2.1. Fears and phobias	3.10. Blood sugar insufficiency	5.6. Lack of situational awareness/risk perception/risk awareness
2.2. Emotional disturbance	3.11. Alcohol/Drugs/Other Self Imposed Stress	5.7. Inadequate initial instruction/skill training
2.3. Mental illness	4. Mental/Psychological Stress	5.8. Inadequate practice
2.4. Intelligence level	4.1. Emotional overload	5.9. Infrequent performance
2.5. Inability to comprehend	4.2. Fatigue due to mental task load or speed	5.10. Inadequate coaching
2.6. Poor coordination	4.3. Extreme judgement/decision demands	5.11. Inadequate review instruction
2.7. Slow reaction time	4.4. Routine/monotony/boredom/overly routine tasks	
		6. Improper Motivation
		6.1. Improper performance/behavior is tolerated/rewarded
		6.2. Proper performance/behavior is discouraged/punished
		6.3. Lack of incentive
		6.4. Improper production incentive
		6.5. Improper Cost Reduction incentive
		6.6. Excessive frustration
		6.7. Inappropriate aggression
		6.8. Improper attempt to save time/effort
		6.9. Improper attempt to avoid discomfort
		6.10. Improper attempt to gain attention
		6.11. Inadequate discipline
		6.12. Inappropriate peer pressure
		6.13. Improper leadership example
		6.14. Inadequate performance feedback
		6.15. Inadequate reinforcement of proper behavior
		6.16. Abuse (Intentionally)
		6.17. Misuse (unintentionally)

BASIC CAUSES – JOB/SYSTEM FACTORS		
7. Unclear Organizational Structure	10.5. Inadequate consideration of human/ergonomic factor in design	12.5. Inadequate communication of corrective maintenance needs
7.1. Unclear/conflicting reporting relationship	10.6. Inadequate design process / standard / specification / criterion	12.6. Inadequate scheduling of maintenance work
7.2. Unclear/conflicting assignment of function/role	10.7. Inadequate process control automation	12.7. Inadequate assessment of repair needs
7.3. Unclear/conflicting accountability/responsibility/task	10.8. Inadequate (technical) standard/specification or absence thereof	12.8. Inadequate parts substitution/replacement
8. Inadequate Leadership	10.9. Inadequate review of project risks	12.9. Inadequate inspection method/interval
8.1. Inadequate HSEQ/asset strategy	10.10. Inadequate monitoring of construction / fabrication / assembly	12.10. Unable to inspect
8.2. Inadequate leadership development	10.11. Inadequate assessment of operational readiness	13. Excessive Wear/Tear
8.3. Inadequate delegation	10.12. Inadequate commissioning/handover process	13.1. Inadequate planning of use
8.4. Inadequate standards	10.13. Inadequate monitoring of initial operation	13.2. Improper decision on extension of service life
8.5. Inadequate communication/implementation of policy/procedure/practice	10.14. Inadequate management of change process	13.3. Inadequate inspection/monitoring
8.6. Conflicting policy/procedure/practice	11. Inadequate Supply Chain Management	13.4. Improper loading/lift of use
8.7. Inadequate work/process planning/programming	11.1. Inadequate specification on requisition/purchase order	13.5. Used for wrong purpose/task/activity
8.8. Condone deviation from policy/procedure/practice	11.2. Inadequate research on material / equipment / tool / supply / etc.	14. Inadequate Tool/Equipment/Machinery/Device
8.9. Condone misuse of equipment/tool	11.3. Inadequate specification to vendor	14.1. Inadequate assessment of needs and risks
8.10. Condone improper/inappropriate behavior	11.4. Inadequate mode/route of shipment	14.2. Inadequate consideration of human factors/ergonomics
8.11. Inadequate management information	11.5. Inadequate shelf life/validation for re-use of materials/equipment	14.3. Inadequate supplier standard/specification
8.12. Inadequate monitoring/closure of audit actions	11.6. Inadequate communication of information about hazards	14.4. Incorrect measurement/detection/process/control
9. Inadequate Supervision/Coaching	11.7. Improper handling of material	14.5. Inadequate availability of tool / equipment / machinery / device
9.1. Inadequate instruction/orientation/training	11.8. Improper storage of material	14.6. Inadequate inspection/repair/maintenance
9.2. Inadequate information documents in supervision/coaching	11.9. Improper transporting of material	14.7. Inadequate adjustment/calibration
9.3. Lack of supervisory/management job knowledge	11.10. Inadequate shelf life/validation for re-use of materials/equipment	14.8. Inadequate salvage and reclamation
9.4. Inadequate match between qualifications and job/task requirements	11.11. Inadequate identification of material	14.9. Inadequate removal and replacement of unsuitable items
9.5. Inadequate performance measurement and evaluation	11.12. Improper salvage/waste disposal	15. Inadequate Product/Service Design
9.6. Inadequate performance feedback	11.13. Inadequate selection of contractor/supplier	15.1. Inadequate assessment of needs and risks
10. Inadequate Management of Change	12. Inadequate Maintenance/Inspection	15.2. Inadequate product/service standard/specification/concession system
10.1. Inadequate hazard identification/risk evaluation in design	12.1. Inadequate assessment of preventive maintenance needs	15.3. Inadequate product/service design/development
10.2. Inadequate identification of failure mode	12.2. Inadequate preventive lubrication and servicing	15.4. Inadequate product/service standard
10.3. Inadequate evaluation of customer/stakeholder requirement	12.3. Inadequate adjustment/assembly	15.5. Inadequate product/service design validation
10.4. Inadequate identification of legal requirement	12.4. Inadequate preventive cleaning/resurfacing	15.6. Inadequate product/service design verification

CONTROL AREAS FOR IMPROVEMENT ACTIONS			
S	PS	C	
1 - LEADERSHIP			5.5. Information Security
1.1. Purpose and Values			5.6. Product Stewardship
1.2. Goals			5.7. Compliance Assessment
1.3. Policy			5.8. Process Safety Regulations
1.4. Strategy			5.9. Security of Process Information
1.5. Stakeholder Engagement			6 - PROJECT MANAGEMENT
1.6. Business Processes			6.1. Project Co-ordination
1.7. Business Risks			6.2. Project Planning
1.8. Accountabilities			6.3. Project Execution
1.9. Management Commitment			6.4. Project Control
1.10. Process Safety Leadership			6.5. Project Close Out
2 - PLANNING AND ADMINISTRATION			6.6. Process Safety Project Reviews
2.1. Business Planning			7 - TRAINING AND COMPETENCE
2.2. Work Planning and Control			7.1. Training System
2.3. Action Tracking			7.2. Training Needs Analysis
2.4. Management System Documentation			7.3. Instructor Competence
2.5. Records			7.4. Delivery of Training
2.6. Process Safety Planning			7.5. Leadership Orientation/Induction
3 - RISK EVALUATION			7.6. General Orientation/Induction
3.1. Health Hazard Identification and Evaluation			7.7. Job Orientation/Induction
3.2. Safety Hazard Identification and Evaluation			7.8. Training Systems Evaluation
3.3. Security Hazard Identification and Evaluation			8 - COMMUNICATIONS AND PROMOTION
3.4. Environmental Hazards Identification and Evaluation			8.1. Communication System
3.5. Customer Expectations Identification and Evaluation			8.2. Meeting Co-ordination
3.6. Task Risk Evaluation			8.3. Management Meetings
3.7. Process Safety Information			8.4. Group Meetings
3.8. Process Hazard Analysis			8.5. Joint Committee/Council
4 - HUMAN RESOURCES			8.6. Coaching
4.1. Human Resources System			8.7. Recognition
4.2. Recruitment			8.8. Promotion Campaigns
4.3. Managing Individual Performance			8.9. Away from Work Safety Information
4.4. Recognition and Discipline			8.10. Process Safety Awareness
4.5. Leaving the Organization			9 - RISK CONTROL
4.6. Management of Organizational Change			9.1. Health Hazards Controls
4.7. Process Safety Human Resources			9.2. Safety Hazards Controls
5 - COMPLIANCE ASSURANCE			9.3. Security Controls
5.1. Regulations			9.4. Environmental Hazard Controls
5.2. External Authorizations to Operate			9.5. Quality Control of Materials and Products
5.3. Industry Codes and Standards			9.6. Process Control and Operating Procedures
5.4. Reporting to Authorities			9.7. Rules
			9.8. Work Permits
			9.9. Warning Signs and Notices
			9.10. Personal Protective Equipment
			9.11. Process Hazard Controls
			9.12. Operating Procedures for Controlling Process Risks
			9.13. Major Hazard Reports
			10 - ASSET MANAGEMENT
			10.1. Maintenance Program
			10.2. Maintenance Planning and Scheduling
			10.3. Execution of Maintenance
			10.4. Maintenance Review
			10.5. General Conditions Inspections
			10.6. Physical Conditions Tour
			10.7. Special Equipment Inspections
			10.8. Pre-Use Equipment Inspections
			10.9. Engineering Change Management
			10.10. Inspection, Measuring and Test Equipment
			10.11. Acquisition and Sale
			10.12. Asset Integrity Program
			10.13. Process Safety Inspections
			11 - CONTRACTOR MANAGEMENT / PURCHASING
			11.1. Contractor/Supplier Selection
			11.2. Contractor Quality Assurance
			11.3. Contractor/Supplier Assurance
			11.4. Supply Chain and Purchasing
			11.5. Logistics
			11.6. Managing Contractors in Process Areas
			12 - EMERGENCY PREPAREDNESS
			12.1. Emergency Needs Assessment
			12.2. Site Emergency Plan
			12.3. Off-Site Emergency Plan
			12.4. Crisis Plan
			12.5. Business Continuity Plan
			12.6. Emergency Plan Review
			12.7. Emergency Communications
			12.8. Emergency Protection Systems
			12.9. Energy Controls
			12.10. Emergency Teams
			12.11. Drills and Exercises
			12.12. First Aid
			12.13. Medical Support
			12.14. Organized Outside Help and Mutual Aid
			12.15. Preparedness for Major Accidents
			13 - LEARNING FROM EVENTS
			13.1. Learning from Events System
			13.2. Learning from Success
			13.3. Participation in Investigations
			13.4. Near-Miss and Substandard Conditions
			13.5. Complaints Management
			13.6. Event Announcements
			13.7. Away-from-Work Accidents
			13.8. Action Follow-Up
			13.9. IFE Reporting Verification
			13.10. Event Analysis
			13.11. Improvement Teams
			14 - RISK MONITORING
			14.1. Health Hazard Monitoring
			14.2. Safety Hazard Monitoring
			14.3. Security Hazard Monitoring
			14.4. Environmental Hazard Monitoring
			14.5. Customer Satisfaction
			14.6. Effectiveness of Monitoring
			14.7. Perception Surveys
			14.8. Behavioral Observation
			14.9. Task Observations
			14.10. Audits
			14.11. Process Hazard Monitoring
			15 - RESULTS AND REVIEW
			15.1. Business Results
			15.2. Management Review
			15.3. Reporting to Stakeholders
			15.4. Residual Risk Management