Start Here With Each Causal Factor

After identifying an intermediate cause, proceed to light green to identify root causes.

Structural (1)

Design Problem (6)

Design Input/Output (20)

- **Design Input Issue (21)**
  - Design Scope Unclear (22)
  - Design Input Obsolete (23)
  - Design Input Incorrect (24)
  - Necessary Design Input Not Available (25)
- **Design Output Issue (26)**
  - Design Output Unclear (27)
  - Design Output Incorrect (28)
  - Design Output Inconsistent (29)
  - Design Input Not Addressed in Design Output (30)

Design Review/Verification (31)

- **No Independent Review/Verification (32)**
- **Review/Verification Issue (33)**

Maintenance Program Design (34)

- **No Program (35)**
- **Program Inadequacy (36)**
  - Critical Equipment/System Not Identified (37)
  - Inappropriate Maintenance Type Applied (38)
  - Acceptance Criteria Inadequate (39)

Maintenance Program Implementation (40)

- **Planned Maintenance Issue (41)**
  - Scheduling Issue (42)
  - Scope Issue (43)
  - Implementation Issue (44)
- **Condition Monitoring Maintenance Issue (45)**
  - Scheduling Issue (46)
  - Detection Issue (47)
  - Monitoring Issue (48)
  - Troubleshooting/Corrective Action Issue (49)
  - Implementation Issue (50)
- **Shore-based Maintenance Issue (51)**
  - Event Specification Issue (52)
  - Scheduling Issue (53)
  - Scope Issue (54)
  - Implementation Issue (55)
- **Corrective Maintenance Issue (56)**
  - Troubleshooting/Corrective Action Issue (57)
  - Repair Implementation Issue (58)
- **Failure Finding Maintenance Issue (59)**
  - Scheduling Issue (60)
  - Scope Issue (61)
  - Troubleshooting/Corrective Action Issue (62)
  - Implementation Issue (63)
- **Servicing and Routine Inspection Issue (64)**
  - Scheduling/Frequency Issue (65)
  - Scope Issue (66)
  - Implementation Issue (67)

Equipment Records (68)

- **Equipment Design Records (69)**
- **Manufacturer's Manuals (70)**
- **Equipment Operating/Maintenance History (71)**

Human (4)

Permanent/Returning Officers/Crew (10)

Newly Assigned/Contract/Temporary Officers/Crew (11)

Company Employee (12)

Other (Third-Party Employee) (13)

Management Systems (72)

- **Health, Safety, Environment Issue (73)**
  - No Program (74)
  - Program Inadequate/Not Specific Enough (75)
  - Management Inadequate (76)
  - Record Keeping Issue (77)
  - No/Poor Spill/Emergency/Contengency Plan (78)
  - No/Inadequate Job Safety Analyses (79)
  - No/Inadequate Safe Work Practices (80)
- **Human Resource Issue (81)**
  - Employee Screening/Hiring Issue (82)
  - Resource/Staffing Issue (83)

Procedures (120)

- **Safety/Hazard/Risk/Security Review Issue (84)**
  - Review Skipped or Incomplete (85)
  - Recommendations Not Yet Implemented (86)
  - Risk Acceptance Criteria Issue (87)
  - Ineffective Review (88)
- **Problem Identification/Control Issue (89)**
  - Problem Reporting Issue (90)
  - Problem Analysis Issue (91)
  - Audit Issue (92)
  - Corrective Actions Ineffective (93)
  - Corrective Actions Not Implemented (94)
- **Change Control Issue (95)**
  - Change Not Identified (96)
  - Change Review Issue (97)
  - Change Verification Issue (98)
  - Change Not Documented (99)
- **Document/Drawing Control Issue (100)**
  - Documentation Content Inaccurate or Incomplete (101)
  - Required Documents Not Available or Missing (102)
  - Obsolete Documents Being Used (103)
  - Change Review or Approval Not Performed (104)
- **Vessel Spares/Stores Issue (105)**
  - Handling Issue (106)
  - Storage Issue (107)
  - Packaging/Transport Issue (108)
  - Substitution Issue (109)
  - Inventory Issue (110)
  - Inspection Issue (111)
- **Purchasing Issue (112)**
  - Purchasing Specifications Issue (113)
  - Changes to Purchasing Specifications (114)
  - Supplier/Contractor Selection Issue (115)
  - Inspection on Receipt Issue (116)
- **Charter/Contract Fulfillment Issue (117)**
  - Charter Requirements Not Documented/Communicated (118)
  - Vessel Not Suitable for Charter Requirements (119)
- **Not Used (121)**
  - No Procedure for Task/Operation (122)
  - Procedure Not Readily Available or Inconvenient to Obtain (123)
  - Language Difficulty (124)
- **Misleading/Confusing (125)**
  - Format Confusing/Complex/Difficult to Use (126)
  - Multiple Actions per Step (127)
  - No Checkout Space Provided but Should Be (128)
  - Content Issue (129)
  - Graphics/Drawing Issue (130)
  - Ambiguous/Confusing Language/Wording Issue (131)
  - Insufficient or Excessive References (132)
  - Too Much/Little Detail (133)
  - Procedure Difficult to Identify (134)
- **Wrong/Incomplete (135)**
  - Typographical Error (136)
  - Wrong Action Sequence (137)
  - Facts/Wrong/Requirements Incorrect (138)
  - Obsolete Version Used (139)
  - Inconsistency Between Requirements (140)
  - Incomplete/Situation Not Covered (141)
  - Overlap or Gaps Between Procedures (142)

Human Factors (143)

- **Workload (144)**
  - Sustained High Workload/Fatigue (145)
  - Excessive Action Requirements (146)
  - Unrealistic Monitoring Requirements (147)
  - Insufficient Time to Respond (148)
  - High Transient Workload (149)
- **Situations Awareness (150)**
  - Information Incomplete/Unuseable (151)
  - Information Inaccurate (152)
  - Information Inaccessible (153)
  - Information Unverified (154)
  - Alarm/Signal Issue (155)
  - Excessive/Complex Calculations Required (156)
  - Knowledge-based Decision Required (157)
- **Work Environment (158)**
  - Ambient Conditions Issue (159)
  - Protective Clothing/Equipment Issue (160)
  - Slippery/Unsteady Work Surfaces (161)
  - Housekeeping Issue (162)
  - Tool Issue (159)
  - Other Excessive Workplace Stresses (163)
- **Workplace Layout (165)**
  - Individual Control/Display/Alarm Issue (166)
  - Control/Display/Alarm Integration/Arrangement Issue (167)
  - Awkward/Inconvenient/Inaccessible Location of Control/Display/Alarm (168)
  - Inconsistent/Mirrored Layout (169)
  - Awkward/Inconvenient/Inaccessible Equipment Location (170)
  - Poor/Illegible Labeling of Equipment or Space (171)
  - Labeling Language Issue (172)
  - Poor Accessibility (173)
  - Inadequate Visibility/Line of Sight (174)
- **Intolerant System (175)**
  - Errors Not Detectable (176)
  - Errors Cannot Be Corrected/Mitigated (177)

Training/Personnel Qualifications (178)

- **No Training (179)**
  - Decision Not to Train (180)
  - MS Familiarization Not Provided (181)
  - Training Requirements Not Fulfilled (182)
  - Training Need Not Identified (183)
- **Training Records System Issue (184)**
  - Training Records Incorrect (185)
  - Training Certificate/Endorsement Expired/Invalid (186)
- **Training Issue (187)**
  - Training Program Design/Objectives Issue (188)
  - Content Issue (189)
  - On-the-job Training Issue (190)
  - Qualification Testing Issue (191)
  - Continuing Training Issue (192)
  - Emergency Preparedness Training Issue (193)
  - Special Operations Training Issue (194)
- **Qualifications Issue (195)**
  - No License/Certificate (196)
  - Expired License/Certificate (197)
  - Forged Document (198)
  - Unclear License/Certificate/Endorsement Requirement (199)

Responsibility/Authority (200)

- **Responsibility/Authority Not Defined (201)**
- **Responsibility/Authority Unclear (202)**
  - Ambiguous (203)
  - Conflicting/Overlapping (204)
  - Not Documented (205)

Operations/Job Supervision (206)

- **Preparation (207)**
  - Planning, Scheduling, or Tracking of Work Activities Issue (208)
  - No Preparation (209)
  - Unclear Instructions to Personnel (210)
  - Ineffective Walkthrough (211)
  - Scheduling/Rotation Issue (212)
  - Personnel Selection/Assignment Issue (213)
- **Supervision During Work (214)**
  - Insufficient Supervision (215)
  - Improper Performance Not Corrected (216)
  - Crew Coordination Issue (217)
  - Fatigue Management Issue (218)
  - Ineffective Teamwork (219)

Communications (220)

- **No Communications or Untimely (221)**
  - Method Unavailable or Inadequate (222)
  - Communication Between Work Parties Issue (223)
  - Communication Between Vessel and Owner Issue (224)
  - Communication with Other Vessels (225)
  - Communication with Charterer Issue (226)
  - Communication with Parties Ashore Issue (227)
- **Communication Misunderstood/Incorrect (228)**
  - Standard Terminology Not Used (229)
  - Language/Translation Issue (230)
  - Verification or Repeat-back Not Used (231)
  - Long Message (232)
  - Garbled Message (233)
  - Wrong Instructions (234)
- **Bridge Team Management (235)**
  - Unclear Communications (236)
  - Information Not Communicated (237)
  - Information Ignored (238)
  - Ambiguous Information (239)
  - Communication with Pilot (240)
- **Duty/Watch Handover Issue (241)**
  - Communication Within Watch Issue (242)
  - Communication at Watch Handover Issue (243)
  - Personnel Change/Relief Procedure Issue (244)

Personnel Performance (245)

- **Company Issue (246)**
  - Inadequate Problem Detection/Situational Awareness (247)
  - Rewards/Incentives Issue (248)
- **Individual Issue (249)**
  - Inadequate Sensory/Perceptual Abilities* (250)
  - Poor Reasoning* (251)
  - Inadequate Motor/Physical Capabilities* (252)
  - Disregards for Company Procedures/Policies* (253)
  - Inadequate Rest/Sleep (Fatigue)* (254)
  - Personal Medication Use/Abuse* (255)

External Factors (5)

Uncharted/Unknown Hazard to Navigation (14)

Sea/Weather Condition (15)

Sabotage/Terrorism/War (16)

Suicide/Homicide (17)

External Events (18)

Other (19)

Enter Here With Each Intermediate Cause

Company Standards, Policies, or Administrative Controls (SPACs) Issue (256)

- No SPACs/Issue Not Addressed (257)
- Not Strict Enough (258)
- Confusing, Contradictory, or Incomplete (259)
- Technical Error (260)

Company Standards, Policies, or Administrative Controls (SPACs) Not Used (261)

- Tolerable Risk (262)
- Unaware of SPACs (263)
- Recently Changed SPACs (264)
- Enforcement Issue (265)

Industry Standard Issue (266)

- Situation Not Addressed by Standard (267)
- Standard Confusing, Contradictory (Internal or External), or Incomplete (268)
- Technical Concern with Standard (269)
- Inappropriate Standard Applied (270)

Marine Root Cause Analysis Map™

Shape	Description
	Problem
	Problem Category
	Cause Category
	Cause Type
	Intermediate Cause
	Root Cause Type
	Root Cause

Notes

Numbers here correspond to the Map Item number in Appendix A of the **ABS** *Guidance Notes on the Investigation of Marine Incidents*

* These Items are for descriptive purposes only. Code only to *Personnel Performance - Individual Issue.*

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