

Title	Research Report 89: A Methodology for Hazard Identification on EER Assessments
Publisher/Author	HSE
Publication Date	2001
Executive Summary	<p>A study has been carried out by RM Consultants Ltd for the Health and Safety Executive (Offshore Safety Division) to investigate the possibility of applying a “HAZOP” type approach to the assessment of Evacuation, Escape and Rescue (EER) from offshore installations.</p> <p>A review of the current approaches to EER assessment showed that the identification of potential failures and hazards that can affect the success of EER tended to be non-systematic, subjective and even superficial. A ‘HAZOP’ type technique is systematic and, if applied correctly, will be comprehensive, so it has the potential to address these concerns and should greatly benefit current approaches to hazard identification during EER. Such a technique was developed in the subsequent phases of the study.</p> <p>As a first step general reference model of the EER process was defined in order to produce a framework for the hazard identification exercise which followed. This model divided the EER process into the following main stages; Alarm, Access, Muster, Egress, Evacuation, Escape and Rescue. Variations within each stage were considered. For each of these stages a comprehensive list of hazards that can affect EER was derived. Hazards that may arise due to design, physical conditions, command and control errors and human failures were identified.</p> <p>It was not intended that the hazard list would provide a checklist of hazards during EER for use outside the study. It was too generic for this purpose, but to use it only within the study as a basis for the development of the hazard identification technique. Obviously, the developed technique should be able to identify all the hazards on the list and it was considered that a “HAZOP” type technique would fulfil this requirement.</p> <p>Development of the “HAZOP” technique for application to the EER process was performed by a team of specialists within a workshop. The team reviewed the EER hazards list and a set of 9 guidewords and 53 property words was developed to match the identified EER hazards. The final set of guidewords is:</p> <ul style="list-style-type: none"> Failed Impaired/Damaged Fails During Not Done Inadequate/Insufficient Incorrect/Inappropriate Too Late/Soon Congested/Overloaded <p>Examples of property words, to be used in conjunction with these guidewords, for the Alarm and Access EER stages are as follows:</p> <ul style="list-style-type: none"> Alarm Stage – Alarm_System (System, Information) Response Communication (System, Information) Access Stage – Escape_Route Decision Movement

	<p>Each EER Stage has a specific set of property words.</p> <p>The guidewords and property words were tested within the workshop by performing a trial HAZOP on an example installation for the first three stages of EER (Alarm, Access and Muster).</p> <p>The trial HAZOP exercise showed that the success of an EER “HAZOP” is dependent on the quality of information provided and the expertise of the participants. Careful preparation is essential and the HAZOP team should include specialists in installation, design, operations, risk assessment and human factors.</p> <p>A brief comparison with a checklist approach was performed and concluded that, even taking into account the resources required (e.g. expertise, time) the perceived benefits of the “HAZOP” approach (systematic and comprehensive) outweigh the apparently simpler checklist method.</p> <p>Overall, the results of the study show that a “HAZOP” type technique should complement and greatly benefit current approaches by providing more systematic and comprehensive identification of hazards during EER. The methodology that has been developed in this study provides a workable basis for performing such EER “HAZOPS”</p>																																																										
Table of Contents	<table border="0"> <tr> <td>SUMMARY</td> <td>v</td> </tr> <tr> <td>GLOSSARY.....</td> <td>vii</td> </tr> <tr> <td>1. INTRODUCTION</td> <td>1</td> </tr> <tr> <td> 1.1 Background.....</td> <td>1</td> </tr> <tr> <td> 1.2 Objectives</td> <td>1</td> </tr> <tr> <td> 1.3 Scope.....</td> <td>2</td> </tr> <tr> <td> 1.4 Study methodology</td> <td>2</td> </tr> <tr> <td>2. REVIEW OF CURRENT APPROACHES TO HAZARD IDENTIFICATION DURING EER</td> <td>4</td> </tr> <tr> <td> 2.1 Review approach</td> <td>4</td> </tr> <tr> <td> 2.2. Review findings</td> <td>4</td> </tr> <tr> <td>3 DEFINITION OF THE EER MODEL</td> <td>6</td> </tr> <tr> <td> 3.1 Description of the EER process</td> <td>6</td> </tr> <tr> <td> 3.2 The EER model</td> <td>8</td> </tr> <tr> <td>4 DEVELOPMENT OF THE EER CRITERION HAZARDS LIST</td> <td>10</td> </tr> <tr> <td> 4.1 Approach used for hazard identification</td> <td>10</td> </tr> <tr> <td> 4.2 Human failures during EER.....</td> <td>10</td> </tr> <tr> <td> 4.3 Review of installation specific hazards.....</td> <td>11</td> </tr> <tr> <td> 4.4 Development of hazard identification tables</td> <td>12</td> </tr> <tr> <td>5. DEVELOPMENT OF THE HAZOP TECHNIQUE FOR EER</td> <td>15</td> </tr> <tr> <td> 5.1 General description of the application of the HAZOP technique .</td> <td>15</td> </tr> <tr> <td> 5.2 The HAZOP workshop</td> <td>15</td> </tr> <tr> <td> 5.3 Development of guidewords and property words</td> <td>17</td> </tr> <tr> <td> 5.4 The Trial HAZOP</td> <td>20</td> </tr> <tr> <td>6. RESULTS</td> <td>21</td> </tr> <tr> <td> 6.1 Phases 1 and 2 results</td> <td>21</td> </tr> <tr> <td> 6.2 HAZOP workshop- results</td> <td>22</td> </tr> <tr> <td> 6.2.1 The trial HAZOP.....</td> <td>22</td> </tr> <tr> <td> 6.2.2 Comparison with checklist approach</td> <td>22</td> </tr> <tr> <td> 6.3.4 Discussion of HAZOP workshop results</td> <td>25</td> </tr> </table>	SUMMARY	v	GLOSSARY.....	vii	1. INTRODUCTION	1	1.1 Background.....	1	1.2 Objectives	1	1.3 Scope.....	2	1.4 Study methodology	2	2. REVIEW OF CURRENT APPROACHES TO HAZARD IDENTIFICATION DURING EER	4	2.1 Review approach	4	2.2. Review findings	4	3 DEFINITION OF THE EER MODEL	6	3.1 Description of the EER process	6	3.2 The EER model	8	4 DEVELOPMENT OF THE EER CRITERION HAZARDS LIST	10	4.1 Approach used for hazard identification	10	4.2 Human failures during EER.....	10	4.3 Review of installation specific hazards.....	11	4.4 Development of hazard identification tables	12	5. DEVELOPMENT OF THE HAZOP TECHNIQUE FOR EER	15	5.1 General description of the application of the HAZOP technique .	15	5.2 The HAZOP workshop	15	5.3 Development of guidewords and property words	17	5.4 The Trial HAZOP	20	6. RESULTS	21	6.1 Phases 1 and 2 results	21	6.2 HAZOP workshop- results	22	6.2.1 The trial HAZOP.....	22	6.2.2 Comparison with checklist approach	22	6.3.4 Discussion of HAZOP workshop results	25
SUMMARY	v																																																										
GLOSSARY.....	vii																																																										
1. INTRODUCTION	1																																																										
1.1 Background.....	1																																																										
1.2 Objectives	1																																																										
1.3 Scope.....	2																																																										
1.4 Study methodology	2																																																										
2. REVIEW OF CURRENT APPROACHES TO HAZARD IDENTIFICATION DURING EER	4																																																										
2.1 Review approach	4																																																										
2.2. Review findings	4																																																										
3 DEFINITION OF THE EER MODEL	6																																																										
3.1 Description of the EER process	6																																																										
3.2 The EER model	8																																																										
4 DEVELOPMENT OF THE EER CRITERION HAZARDS LIST	10																																																										
4.1 Approach used for hazard identification	10																																																										
4.2 Human failures during EER.....	10																																																										
4.3 Review of installation specific hazards.....	11																																																										
4.4 Development of hazard identification tables	12																																																										
5. DEVELOPMENT OF THE HAZOP TECHNIQUE FOR EER	15																																																										
5.1 General description of the application of the HAZOP technique .	15																																																										
5.2 The HAZOP workshop	15																																																										
5.3 Development of guidewords and property words	17																																																										
5.4 The Trial HAZOP	20																																																										
6. RESULTS	21																																																										
6.1 Phases 1 and 2 results	21																																																										
6.2 HAZOP workshop- results	22																																																										
6.2.1 The trial HAZOP.....	22																																																										
6.2.2 Comparison with checklist approach	22																																																										
6.3.4 Discussion of HAZOP workshop results	25																																																										

7. CONCLUSIONS.....	26
8. REFERENCES	27
APPENDIX 1: BIBLIOGRAPHY	29
APPENDIX 2: THE HIERARCHICAL TASK ANALYSIS DIAGRAMS	35
APPENDIX 3: THE HAZARD IDENTIFICATION TABLES	41
APPENDIX 4: GLOSSARY OF EER HAZOP GUIDEWORDS	51
APPENDIX 5: NOTES ON EER HAZOP GUIDEWORDS	71
APPENDIX 6: TRIAL EER HAZOP TABLES	75