The Offshore Management of Human Factors Inspection Guide

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Fully Open

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Review History

Date	Changes

Target Audience

OSDR Inspectors / ED Offshore Inspectors / ED Specialist Inspectors

Contents

Summary

This inspection guide (IG) outlines an approach to inspecting the management of human factors (HF) in the United Kingdom Continental Shelf (UKCS) offshore oil and gas sector. The guide focuses on the key areas that should be considered when inspecting this topic. It also sets out the criteria against which dutyholder performance will be rated. Reference is made to technical standards and guidance that inspectors will use to form an opinion of legal compliance.

Dutyholders should be able to demonstrate how HF is accounted for in the assessment and management of major accidents. HF should be integrated throughout the safety management system to ensure a systematic approach is adopted for managing the human element of major accident hazard risk across the entire lifecycle of the installation.

It is recognised that HF is a broad topic area and that dutyholders do not have access to infinite resources, therefore it is important that a targeted, risk orientated approach based on good practice is taken when addressing HF topics.

Technical competence in HF is a crucial enabler for human factors integration and will be evaluated throughout inspections. Dutyholders may choose to draw on external expertise and/or appoint an internal resource to support and drive HF integration and studies. As a minimum dutyholders should look to maintain intelligent customer capability to ensure resources, scopes of work and deliverables are appropriate.

Due to the broad nature of HF topics, it is likely that inspectors across Energy Division (ED) will be required to address elements associated with managing HF, for example, risk assessment, safety critical tasks, safe staffing levels, procedures and alarm management. Consulting with this IG and directly with the Human Factors Team will ensure that human factors elements are appropriately addressed through inspection, investigation and subsequent enforcement action.

Introduction

The purpose of this IG is to provide information and guidance to Offshore Safety Directive Regulator (OSDR) inspectors to support the delivery of consistent and effective inspection of dutyholders arrangements to comply with HSE's human factors inspection requirements.

This IG is written to complement the Human Factors Roadmap for the Management of Major Accident Hazards, and highlights key areas for inspection areas which contribute to the management of human factors risk based on research, lessons learnt from previous incidents, published industry standards and good practice guidance. It provides a framework against which inspectors can judge compliance by identifying benchmark standards and examples of good practice for each inspection topic in order to support the assignment of performance ratings and determine what enforcement action should be taken with respect to legislative breaches.

Human Factors

HF is an integrated discipline which applies psychological and physiological principles to the engineering and design of products, processes and systems with the goal of managing the risk of human error, optimising human reliability, enhancing safety, improving comfort and supporting productivity.

The management of HF is an essential element of major accident hazard (MAH) management in the offshore oil and gas industry and forms a key component of regulatory activity.

The primary goal of HF, is to reduce the likelihood and consequences of human failure where it could lead to, or fail to mitigate, a MAH, or lead to the degradation of a safety barrier in place to prevent a MAH.

The Assessment Principles for Offshore Safety Cases (APOSC) sets of the fundamental principles associated with managing HF.

Principle 8 requires that 'risk evaluation should consider people as both a key element in safe operation and as a potential cause of major accidents and their escalation', that dutyholders take account of human and organisational factors in their major accident risk evaluation, that "safety and environmentally critical tasks should be analysed", that 'human performance problems should be systematically evaluated, and “the depth of analysis should be appropriate to the severity of the consequences of failure of the task”.

Principle 10 requires dutyholders to keep risks and possible further risk reduction measures under review, taking into consideration advances in technology and knowledge. This includes advances in HF good practice.

Principle 13 requires dutyholders to take into account HF principles alongside sounds engineering and management when deciding on what is reasonably practicable.

Relevant Legislation

Offshore Installations (Offshore Safety Directive) (Safety Case etc) Regulations 2015

Regulation 8 Safety and environmental management system This regulation requires dutyholders to establish a safety and environmental management system which must include a description of the organisational arrangements for the control of major hazards. These arrangements should take account of HF, inclusive of the identification, analysis and control of safety and environmentally critical tasks, and occupational factors which could affect a person's ability to reliably perform such tasks e.g. multi-tasking, long working hours.

Regulation 16 Management and control of major accident hazards This regulation requires dutyholders to include in their safety case a sufficient demonstration that all hazards with the potential to cause a major accident have been identified, all major accident risks have been evaluated, their likelihood and consequences assessed. The major accident risk evaluation should take account of HF through the analysis of safety and environmentally critical tasks and systematic evaluation of human performance problems which could affect a person's ability to reliably perform such tasks.

Regulation 20 Safety case for dismantling fixed installation This regulation requires dutyholders, when revising and preparing their safety case for decommissioning, to take account of human and organisational factors associated with dismantling activities such as the introduction of personnel to the platform who may be unfamiliar with established safety rules and expectations.

Offshore Installations (Prevention of Fire and Explosion, and Emergency Response) Regulations 1995

Regulation 5 Assessment This regulation requires dutyholders to assess major accident hazards arising from fire and explosion and events which may require evacuation, escape and rescue, and identify appropriate arrangements for dealing with them. These assessments should consider the implications of human failure associated with the operation, management or function of any protective / preventative arrangements.

Regulation 9 Prevention of fire and explosion This regulation requires dutyholders to take appropriate measures to prevent fire and explosion. Where people must perform tasks which are associated with this regulation, human and organisational factors issues should be taken into account in the design of procedures and systems.

Regulation 12 Control of emergencies This Regulation requires dutyholders to have appropriate control measures to limit escalation of an emergency. Where equipment is used to control the extent of an emergency the design of such equipment should take HF into account, including ergonomic factors with respect to its operation in an emergency.

Management of Health and Safety at Work Regulations 1999

Regulation 3 Risk assessment This regulation requires dutyholders to carry out a suitable and sufficient assessment of the risks to the health and safety of employees to which they are exposed while they are at work. This includes the risk of human failure.

Regulation 5 Health and safety arrangements This regulation requires dutyholders to implement arrangements for the effective planning, organisation, control, monitoring and review of preventative and protective measures. This includes measures associated with the management of human and organisational factors.

Other legislation

Provision and Use of Work Equipment Regulations 1998

These regulations cover a range of relevant areas related to ergonomics such as the design factors (operating positions, working heights and reach distances), information and instruction and training. See L22 for Guidance on safe use of work equipment

Offshore Installations and Pipeline Works (Management and Administration) Regulations 1995

These regulations cover a range of relevant areas related to HF such as communications, permit to work and instructions**.** See L70 for guidance on the regulations.

Action

Inspectors should review relevant documentation (see Appendix 1 Pre-visit Information Request) prior to the installation visit and test compliance during the installation visit against the 'success criteria' given in Appendix 3).

By the conclusion of the inspection it should be possible to

- determine the appropriate performance rating
- determine the initial enforcement expectation
- consider how and when the issues raised during an inspection are to be closed out

Background

This IG has been developed to

- consolidate HSE approved codes of practices and guidance, international and national standards and relevant industry body guidance into a single IG to determine legal compliance with HF topics areas

- meet the guiding principles of HSE's Enforcement Policy Statement

  - proportionate
  - targeted
  - consistent
  - transparent
  - accountable

- Support the Industry Hydrocarbon Release Plan, which includes HF, by providing a clear framework for which OSDR inspectors can carry out HF inspections.

Other relevant Inspection Guides

It should be noted that, due to the nature of HF as a discipline, there is naturally a degree of cross over to many other specialist areas, particularly to safety and environmental management (SEMS), topics but also to all engineering disciplines.

As such users of this guide should be mindful of other IGs, notably

- Loss of Containment, particularly appendices: 2C (procedures), 2D (competence), 2E (handovers) and 2F (supervision). Topic 3.I Alarm Management of this guide also covers instrumented protective systems.
- Control of Work and Operational Risk Assessment IGs, which overlap particularly with inspection topics in this IG for example, Appendix 1 – 3.A - Analysis of Safety and Environmentally Critical Tasks (SECTs), 3.B Management of Procedures for Safety and Environmentally Criticality Tasks, and 3.E Safety Critical Communications

Specialist Advice

Specialist advice should be sought from the Human Factors Team (ED 4.6) in the following circumstances

1. Where inspectors identify issues in the assessment and/or management of safety and environmentally critical tasks which require enforcement action. Examples include
    - a failure to undertake safety critical task analysis of a task deemed to be safety critical
    - deficiencies in procedure design and use
    - training and competence or
    - the design of working environments, equipment and control systems, and human machine interfaces (HMI)

2. Where inspectors identify occupational or organisational factors which may have a significant impact on an individual's ability to perform safety and environmentally critical tasks which may require further inspection. Examples include
    - safe staffing levels and workload
    - fatigue and shift design
    - supervision and
    - safety culture

3. Where inspectors identify significant organisational or technical change which has the potential to impact on safety and environmentally critical tasks e.g.
    - change of dutyholder
    - outsourcing/insourcing
    - organisational re-structures

4. Where inspectors making early enquiries into incidents identify that human and organisational factors may have contributed to the event.

Organisation

Targeting

It is essential to make sure that dutyholders are robust in their management of HF. Inspections should be planned within the timescales set out by ED divisional management, and should be targeted at dutyholders identified as having the greatest risk gaps.

Timing

Inspections should be undertaken as part of the agreed Intervention Plan, or as determined by the Energy Division Senior Leadership Team (EDSLT).

Resources

The ED4.6 HF team own this IG and take the topic lead on inspecting HF. Resource for inspections against this IG will come from ED4.6 supported by inspection management team (IMT) inspectors, and other specialist teams as appropriate.

Recording and Reporting

The dutyholder performance ratings should be entered on the Inspection Rating (IRF) Tab of the relevant installation Intervention Plan Service Order. Findings should be recorded in the post inspection report and letter.

Appendix 1 - Pre-visit Information Request

When preparing for a HF inspection, inspectors may request a range of information, including policies and procedures, risk assessments, human factors studies, records and key performance indicator data. Table 1 below outlines examples of information that may be requested.

Table 1 Examples of information that may be requested

Topics	Information Request
Analysis of safety and environmentally critical tasks	Safety critical task analysis procedure safety critical task analysis reports
Procedures	Procedure for procedures Example procedures
Training and competence	Training and competence procedure Training and competence standard Training and competence records of individuals/teams
Fatigue risk management	Fatigue risk management procedure Working hours records
Safety critical communications	Shift/crew change handover procedure Permit to work procedure
Control room and equipment design	Human factors/ergonomic studies
Alarm management	Alarm management philosophy Alarm performance data
Safe staffing and workload	Staffing level philosophy / Offshore organisational chart Safe staffing level / Workload studies
Management of organisational change	Management of organisational change procedure
Human factors in projects	Human factors engineering standards Human factors integration plan

Appendix 2 - Sample Inspection Agenda

Advance Information Request

Information Requested by	**Human Factors** • procedure for safety and environmentally critical task analysis • safety critical task analysis reports / process hazards analysis • design and management of procedures standard • training and competence standard • alarm management procedure • fatigue risk management procedure

Anticipated Schedule and Personnel Requirements

Add detail as required – include timing and personnel requirements where possible

Onshore	**Human Factors** i. implementation status of safety and environmentally critical task analysis on the installation (methodology, schedule, resources, management of actions) ii. inspection of 1 to 2 safety and environmentally critical tasks with appropriate technical authority, including the relevant procedure and training and competence standard iii. implementation status of human factors good practice in procedures for safety and environmentally critical tasks iv. implementation status of human factors good practice in training and competence management for safety and environmentally critical tasks v. implementation status of fatigue risk management system
Offshore	**Human Factors** i. inspection of 1 to 2 safety and environmentally critical tasks, including relevant procedures and training and competence standards, monitoring and supervision. This will include detailed task walk-through-talk-through ii. inspect the status of any actions arising from the safety and environmentally critical task analysis iii. inspection of working time records iv. discussion with personnel in safety and environmentally critical roles about fatigue risk management practices Note: Use of a camera is requested while on board. Please arrange permits, as required

Appendix 3 – Inspection Questions and Success Criteria

3.A - Analysis of Safety and Environmentally Critical Tasks (SECTs)

SECTs are tasks which contribute to both the risk and management of major accident and environmental hazard scenarios. These tasks include those associated with the prevention, detection, control and mitigation of these scenarios, and therefore play a significant role of achieving continued safe operations.

Safety and environmentally critical tasks should be considered throughout the lifecycle of the installation, during design, operations, modifications and decommissioning. Where safety and environmentally critical tasks are undertaken, they should be analysed using human factors good practice to demonstrate that they can be performed reliably when required. Safety and environmentally critical tasks should be considered within a wider hierarchal risk management approach, recognising that even most well motivated, highly experienced people can make errors and mistakes.

When inspecting this topic factors to be considered should include

- the range of tasks that have been identified
- how tasks have been prioritised
- the method and depth of analysis used to identify human failure and performance influencing factors
- control measures used to reduce the risk of human failure

Inspection Questions

1.	Is there a formal process for managing safety and environmentally critical task analysis? **Success Criteria** • a formal process is established for identifying and analysing safety critical tasks. This process aligns with industry good practice • this process should be integrated into the broader system of risk assessment of major accident hazards e.g. HAZOP, HAZID, PHA • the process identifies periodic review criteria e.g. incident, engineering design/modifications, degradation of equipment (level control, safety systems) • qualitative analysis is the expected standard of analysis, if quantitative analysis is used, it should be underpinned by a qualitative analysis
2.	Has a full range of tasks been identified for the installation? **Success Criteria** • tasks should be identified using a range of methods such as HAZOPs, HAZIDs, operating and maintenance procedures and system walkthroughs, and consider a full range of tasks e.g. operations, maintenance, marine, drilling and emergency response • reliance purely on existing procedures to identify tasks is not sufficient as this does could miss tasks which may not be covered by a procedure

	• tasks may be prioritised based on certain task characteristics such as complexity, frequency, consequences of human failures
3.	What human factors methods have been used to analyse tasks? **Success Criteria** • a risk-based approach should be adopted when determining what tasks to analyse, in what order and to what depth • use of a formal task analysis method to describe task e.g. task goals, steps, and the interactions between the people, plant and equipment • use of formal human failure guidewords/taxonomy to identify a full range of human failures • an analysis of the consequences of human failure including any recovery opportunities • an analysis of performance influencing factors which may make failure more likely • the outputs of the analysis should be formally recorded

4.	What is the output of the analysis?
	
	Success Criteria
	
	• the analysis and recommended actions should be formally recorded
	• human failures that present a significant risk to safety are subject to error reduction measures
	    o error reduction measures may include: elimination of the task, redesign of the task or working environment, improvements to training of staff, procedural support, or placing additional barriers in the system to prevent the consequences of errors e.g. fail-safe, error-tolerant designs
	    o the hierarchy of control is applied when addressing human failure (e.g. by eliminating the hazard, rather than simply providing training)
	    o error reduction measures should be based on sound engineering judgement, management, and human factors good practice
	• where performance influencing factors are identified, are actions taken to optimise them?

5.	What human factors training, and experience do the lead analyst and participants have? **Success Criteria** • analysis should be carried out by a suitably trained and experienced individual • representatives of the workforce need to be involved in the process to contribute specific task knowledge and experience • training in human factors for those members of the workforce involved in the analysis can help identify credible errors and performance influencing factors
6.	For hazard studies that incorporate quantitative human failure probability estimates. **Success Criteria**

	• where human error probabilities are used in hazard studies, they should account for uncertainties of produced probability estimates, and should be modified through a qualitative analysis of plant or task specific factors such as supervision, time pressure, design of controls and displays

3.B Management of Procedures for Safety and Environmentally Criticality Tasks

Operating, maintenance, inspection, testing and emergency response procedures help assure human reliability by providing crucial information and prompts to the right people at the right time. Procedures are particularly important when they are used as part of the management of major accident hazards and support safety critical tasks.

When inspecting this topic factors to be considered should include

- the level of reliance placed on procedural measures to control major accident hazards
- the accuracy and quality of the information contained in procedures
- the degree of procedural monitoring in place
- the level of workforce engagement (procedural ownership)

Inspection Questions

1.	Is there a formal process for managing procedures for safety and environmentally critical tasks? **Success Criteria** • a formal process is established for managing procedures • the process is clearly linked to risk assessments e.g. HAZOP, HAZID, PHA, and identified safety and environmentally critical tasks, and covers all foreseeable modes of operation considered e.g. start-up, shutdown, status monitoring, trouble shooting, emergency response and maintenance? • the process identifies periodic procedure review criteria e.g. risk-based reviews following incidents, engineering design/modifications, user feedback
2.	How are human factors considered in the design of procedures? **Success Criteria** • human factors good practice design standards are established to optimise procedure usability e.g. formatting and layout, writing style, presentation of warnings • clear expectations are established on how procedures shall be used e.g. in-hand checklist, signed-off, supervisory oversight • procedures accurately reflect how the task is carried out on site (task sequence, plant labelling, equipment used) • procedure ownership is actively promoted through active involvement of end users and timely responses to procedural issues • the level of authorisation required to issue or amend procedures is proportionate to the criticality of the task
3.	What are the views of the end users of procedures? **Success Criteria** • end users have a good understanding of which procedures are safety and environmentally critical, the role they play in controlling risk

	• end users find procedures support tasks by providing clear, accurate and complete information and instructions • end users feel actively engaged in developing, reviewing maintaining procedures, and confirm there is timely response to their feedback when procedural issues are identified
4.	How is the effectiveness of procedures monitored? **Success Criteria** • management and supervisory compliance checking programmes should be implemented, reviewed and acted upon • key performance indicators should be implemented to monitor the performance of procedural controls

3.C Managing Safety and Environmentally Critical Training and Competence

Training and competence management systems support human reliability by establishing, developing and maintaining technical and non-technical knowledge and skills of those who have responsibilities for managing major accident hazards.

When inspecting this topic factors to be considered should include

- the level of reliance placed on qualifications and certification as a demonstration of competence
- the link between safety and environmentally critical tasks and training and competence management
- arrangements for maintaining competence of infrequent tasks
- the management of contractor training and competence

Inspection Questions

<table>
<tr><td>1.</td><td>Is there a formal process for managing training and competence?

Success Criteria
a formal process is established for managing training and competence.
the process is clearly linked to risk assessments e.g. HAZOP, HAZID, PHA, SCTA and identified safety and environmentally critical tasks, and covers all foreseeable modes of operation e.g. normal, abnormal upsets, emergency response
the process identifies periodic review criteria of training and competence standards e.g. risk-based reviews following incidents, engineering design/modifications, organisational change
the effectiveness of the process is evaluated on a periodic basis through audit and key performance indicators</td></tr>
<tr><td>2.</td><td>What methods are used to determine training and competence assessment standards?

Success Criteria
training and competence assessment standards are established by analysing safety and environmentally critical tasks/work activities, and assessing the consequences if these tasks/work activities are performed incorrectly. The output of this analysis should help in determining
what technical and behavioural skills and underpinning knowledge is required to support personnel in dealing with normal, abnormal and emergency situations
the training and competence assessment methods used to establish and maintain competence e.g. classroom, computer based, structured on-the-job training portfolios and high-fidelity simulations/scenarios to allow participants to experience similar levels of stress in a safe environment
the training refresher frequency, for example infrequently performed tasks may have more frequent or pre-task refresher training</td></tr>
</table>

	○ Measures to ensure impartiality for assessing highly criticality competencies e.g. offshore installation manager (OIM), control room operator (CRO), crane operators
3.	How are competencies assured either during or post recruitment and selection activities? **Success Criteria** • competence criteria should be integrated into recruitment and selection activities (internal transfers, promotions, new employees and freelance or agency personnel) • the recruitment process should determine the extent to which competencies can be demonstrated in the recruitment and selection process, and which require further demonstration post recruitment (i.e. based on the defined competence criteria and risk e.g. installation/task specific competency) • where further competence demonstration is required, additional control measures should be implemented, such as a structured probation periods and increased supervision • caution should be exercised on the reliance placed on certificates or qualifications as these alone do not necessarily replace the need for competence assessment
4.	How is training and competence development prioritised? **Success Criteria** • development plans should be implemented to ensure training and competencies priorities are delivered • training and development plans prioritise the safety-critical competencies • there is sufficient time and resource for trainees to progress through their training plans (i.e. availability of trainee, trainers and assessors)
5.	What processes are in place to ensure that staff, teams and contractors undertake only work for which they have been assessed as competent? **Success Criteria** • there are clearly established limitations on what individuals are authorised to do e.g. approving permits, applying inhibits/overrides, making changes to set points • tasks/activities are assigned to only individuals who have been assessed as competent • there is a system to continually review competencies of the workforce e.g. expired or soon to expire competences, incident investigations indicating shortfalls in competencies, and supervisory role and responsibilities
6.	How is competence of personnel from contractor companies managed? **Success Criteria**

	• there is an agreed competence management process to ensure contractor personnel are competent in the tasks/activities they are performing. This would normally be achieved through a combination of
	  ○ in-house technical competence to identify the necessary competence required of a contractor (intelligent customer capability)
	  ○ shared competence management responsibilities between the dutyholder and contractor company
	  ○ installation specific training and competence assurance
	  ○ verification and audit of the contractor’s competence management systems

3.D Fatigue Risk Management

Fatigue risk management ensures that shift patterns, working hours and other factors that influence fatigue are controlled so not to affect the performance of those in safety and environmentally critical roles.

When inspecting this topic factors to be considered should include

- how shift design influences the risk of fatigue risk
- how working hours are controlled, monitored and reviewed, including call-outs, and changes to shift pattern
- what training is provided to the management, supervision and workforce

Inspection Questions

1.	Is there a formal process for managing fatigue risk?
	
	Success Criteria
	
	• policies and / or procedures for managing fatigue are developed and clearly outlines
	  o roles and responsibilities of those managing fatigue risk
	  o clear rules on shift patterns and working hours
	  o any risk assessment requirements
	  o recording of working hours
	  o monitoring and reviewing arrangements

2.	How have the risks of fatigue been risk assessed? **Success Criteria** • a suitable and sufficient assessment of the risks associated with shift work should be carried out as part of the organisation's health and safety management system. The assessment should draw upon industry specific fatigue risk management guidance and consider how fatigue could impact on the management of major accident hazards • risk assessments should be periodically reviewed whenever changes to shift-working arrangements are considered or made • specialist assessment methods may be appropriate for novel and/or changes to shift patterns
3.	How are the risks of fatigue controlled? **Success Criteria** • shift design should take account of the effects of circadian rhythms on fatigue • overtime and shift swapping should be controlled to ensure they do not present a fatigue risk • sleep environments should support good quality sleep (e.g. temperature, lighting, noise, cabin and bed ergonomics)

	• training and information should be provided to managers, supervisors and the workforce to ensure that they are sufficiently trained to recognise fatigue risk factors and coping strategies
4.	How are working hours monitored? • is there an effective classification and recording system for working hours, including overtime, callouts and additional days worked? • are monitoring systems actively reviewed to ensure any occurrences of overtime/callouts spread equally over all staff and shifts? • are key performance indicators established and investigated to determine the underlying causes and provide input in to control measures? **Success Criteria** • overtime and shift swapping should be recorded, monitored and periodically reviewed • where fatigue risk management issues are identified, appropriate action is taken e.g. limiting patterns of repeated overtime
5.	How is the effectiveness of the policy and/or procedure for managing fatigue risk reviewed? **Success Criteria** • shift-working arrangements are monitored and periodically reviewed to check they are still effective and do not impact on health and safety

3.E Safety Critical Communications

Safety critical communications is concerned about how the risk of communication failure is managed. The focus is on understanding the reliability of these communication channels to ensure all safety critical information is transferred, that it is understood and that the opportunity for misinterpretation is minimised. This includes communication during shift and crew handovers, permit to work systems and tasks which place reliance on accurate communications such as crane and boat operations.

When inspecting this topic factors to be considered should include

- does the environment support reliable communication of information?
- Is safety critical communication prioritised?
- how is safety critical communication information verified?
- how is the effectiveness of shift/crew handover monitored/reviewed?

Inspection Questions

<table>
<tr><td colspan="2">Crew and Shift Handover</td></tr>
<tr><td>1.</td><td>Are crew and shift handover procedures established for managing communications within and between departments (e.g. operations and maintenance)?

Success Criteria

• crew and shift handover procedures define what roles need to conduct handovers, what safety critical information needs to be communicated (e.g. inhibits and overrides, on-going permits/maintenance activities, new/updated safety critical procedures), and how the information shall be communicated (e.g. face to face and in written format)
• cross-checking / confirmation of information and particularly information associated with the management of major accident hazards by in-coming personnel as they assume responsibility for the task
• Other control measures such as staggered crew changes may also be used as a method of managing communications.</td></tr>
<tr><td>2.</td><td>Are job aids used to support reliable communication of crew and shift change handovers?

Success Criteria

• job aids (such as structured logs, computer displays, and handover checklists), based on information needs, should be used to help reduce communication errors e.g. information not communicated, information incorrectly interpreted
• safety and environmentally critical information is repeated using different formats e.g. written and verbal communication
• verification of safety and environmentally critical information should be undertaken to confirm the accuracy of the information e.g. physical cross checking of inhibits log</td></tr>
<tr><td>3.</td><td>Are sufficient resources allocated to prepare and carry out crew and shift handovers?

Success Criteria</td></tr>
</table>

<table>
<tr><td></td><td>those who must prepare and carry handovers feel that sufficient resources are given to facilitate effective handovers
this may include a dedicated time slot where additional support is provided to allow operators to focus on preparing the handover for the on-coming shift, and managing distractions during handover periods.
higher risk handovers are recognised. More time is provided for these handovers and additional personnel may be in attendance</td></tr>
<tr><td>4.</td><td>Does the physical environment support the reliable communication of information?

Success Criteria
the physical environment should be free from distraction and interruption to support reliable communication</td></tr>
<tr><td>5.</td><td>Are communications skills developed and maintained to support reliable shift handovers?

Success Criteria
personnel carrying out crew and/or shift handovers receive appropriate training to develop and maintain competence e.g. two-way communication, seeking of confirmation, clarification and repetition of key points.</td></tr>
<tr><td>6.</td><td>How is the effectiveness of crew and shift handover communications monitored and reviewed?

Success Criteria
the effectiveness of crew and shift handovers should be periodically monitored and reviewed, and findings used to improve the process where required</td></tr>
<tr><td colspan="2">Permit to Work</td></tr>
<tr><td>1.</td><td>How is human factors considered within the permit to work system?

Success Criteria
permits and associated risk assessments should take account of how human failure could contribute directly or indirectly to a major accident hazard e.g. working on wrong equipment, failure to fully isolate, error during maintenance/reinstatement
handover procedures should be established for managing the communication of permits which continue for longer than one shift
where isolations, overrides or inhibits are to be removed they are verified by the person responsible for signing off the permit i.e. issuing or area authority. The verification should not be a paper-based exercise. Physical verification provides an opportunity to capture and recover reinstatement human failures before restarting operations</td></tr>
</table>

3.F Safe Staffing Levels and Workload

Safe staffing levels and workload considers how the number of people in key roles such as process and marine control room operators and technicians, emergency response teams and other critical roles is determined, monitored, and reviewed. Some aspects of safe staffing levels and workload are covered in other topics, for example alarm response rates and working hours can be used in infer workload and safe staffing level issues.

When inspecting this topic factors to be considered should include

- are there any indicators of safe staffing levels or workload issues e.g. working hours, alarm rates?
- are there periods where critical operational parameters are not actively/competently monitored?
- are there any potential task conflicts that could impact on a response to an upset/emergency scenario?
- are there any areas where supervisory oversight maybe compromised e.g. dual operator / supervisory role?

Inspection Questions

Control Room Staffing Levels	
1.	How have safe staffing levels been determined for control rooms? • have formal methods been used to determine the adequacy of control room staffing levels in normal, abnormal, and emergency scenarios? • are there any occasions where the control room is not staffed e.g. operator must undertake tasks outside of the control room? • how is cover for the control room managed e.g. breaks, sickness/absence? **Success Criteria** • formal safe staffing level assessments may be appropriate to demonstrate that SECTs can be performed reliably when required • staffing levels should facilitate timely response to abnormal and emergency situations by competent individuals
2.	Are competency levels considered when determining safe staffing levels in the control rooms? **Success Criteria** • defined safe staffing levels take account of competency levels, recognising that trainee or newly appointed control room operators may not be able to perform to the same level as a fully trained operator, especially in abnormal and emergency situations
General Staffing Levels	
3.	How are safe staffing levels monitored and maintained? • are there any indicators of staffing level issues? ○ workforce concerns

	o reliance on green hats and/or trainees to fill roles o inability to liquidate maintenance o high turnover and/or absences o overtime and extended tours **Success Criteria** • there are systems in place to monitor current and future staffing levels to ensure there is adequate capability in the workforce to enact current and planned work scopes • limitations presented by training gaps, staff absence are recognised, and work scopes amended accordingly. For example o contingency plans should be in place to maintain safe staffing levels, this may include succession planning and skill pool development o where shortfalls in safe staffing occur, they are risk assessed, and controls implemented. (Control measures may range from shutdown, planned reductions in work activities based on the availability/capability of personnel, additional supervision, delegation of tasks and responsibilities)
	Do any roles perform a dual function under any circumstances? • how has training and competence been considered? • are there any potential task conflicts e.g. emergency response, supervisory oversight, workload and fatigue? **Success Criteria** • some roles are designated as dual functions as part of normal operations due to staffing shortages, or as part of response to an emergency. In such circumstances dutyholders should be able to demonstrate how human performance problems such as workload and skill decay have been considered. For example, production supervisors who are expected to stand in for control room operators may require additional training and competence assurance arrangements to be implemented to ensure they maintain their control room operator competence

3.G Management of Organisational Change

Many forms of organisational change can affect the management of major accident hazards. In many cases this impact may be latent and may not be immediately realised. Dutyholders should have structured systems in place to identify organisational changes and assess and manage the impact of such change on their control of major accident hazards.

When inspecting this topic factors to be considered should include

- what types of changes are managed under the management of organisational change process
- what methods are used to assess risk and identify controls
- to what extend are the workforce and safety representatives consulted
- how is the effectiveness of the change assessed, monitored, and reviewed

Inspection Questions

1.	How are organisational aspects of change managed?
	
	Success Criteria
	
	Management of organisational change should be a formalised process which describes
	• a range of organisation changes for example
	    o business mergers
	    o changes to job roles/structures
	    o organisational considerations linked to technical and/or procedural changes
	    o insourcing/outsourcing of business and/or technical services
	• the impact of organisational change on critical tasks, including supervision, management and technical support should be an explicit focus area
	• role and responsibilities at all levels of the organisation who are involved in managing the change should be included
	• senior management should have an active role in managing the risk arising from the change.

2.	What methods are used to identify and assess risks associated with organisational change?
	
	Success Criteria
	
	• risk identification and assessment methods will vary based on the scope and nature of the change. However, there should be a logical link between the change and the method, for example
	    o changes to job roles/team structures should consider task mapping, training and competence and workload analysis
	    o scenario or human reliability assessments may be appropriate where changes are made to key personnel responsible for managing major accident hazards e.g. reductions in control room operators
	• transitional risks should be assessed. For example, requirements for new or amended procedures and/or systems, staffing shortages and training and competency gaps

	• assessments should consider all modes of operations e.g. normal operations, shutdowns, emergency response
3.	How are the workforce consulted during the organisational change? **Success Criteria** • the workforce is meaningfully engaged at all stages of the change process and particularly when key decisions associated with the change are being made • safety representatives have been actively involved in matters that have a potential impact on safety e.g. risk assessment, action reviews, change reviews

4.	What control measures are implemented to manage organisational aspects of change?
	
	Success Criteria
	
	• while control measures should be specific to the risks identified, examples of organisational change controls typically expected are
	    o phased changes wherever possible, to prevent loss of control through over-complexity and avoid peaks in workload
	    o adequate resources to allow necessary extra work such as training and writing new procedures
	    o ample support and/or supervision by competent people for all people with new safety critical work

5.	How are actions managed throughout the change process? **Success Criteria** • an action tracker should be used to manage the status of actions • there is a process of assuring that all actions necessary for managing safety are implemented before key changes are implemented
6.	How is the effectiveness of the change monitored and reviewed? **Success Criteria** • the risk assessment should be used to develop key performance indicators that can be used to monitor the impact of the change on the management of major hazards • key performance indicator data collection should commence before the change, to allow for meaningful data comparison during reviews • reviews should be timed appropriately, and consider that some impacts may not become apparent immediately • reviews should be led by senior management who have the capacity to address any significant safety issues that become apparent during the review process

3.H Control Room and Equipment Design

Human factors should be considered in the design and operation of control rooms and equipment to minimise the potential for human error, under both normal and upset operating conditions. Control rooms and equipment should be designed to optimise the ability to maintain control of the installation, particularly in the event of foreseeable, undesirable events.

Equipment covers a wide range of applications where people need to interact with one or more elements of a 'system', typically to gather information and / or effect actions to change the state of the system in some way. This includes all controls and displays (software, physical, digital and analogue) that the operator uses to control or monitor a function. Human machine interfaces (HMI) covers interfaces on individual control panels, whether that is physically opening and closing a valve or operating a blowout preventer using a touch screen. It includes local systems (e.g. drillers cabins) and centralised control and monitoring environments where the quality of HMI is critical in supporting direct intervention of operators when required.

When inspecting this topic factors to be considered should include

- have any human factors studies been used to improve the control room?
- does the environment support operator interactions in the control room?
- what are the views of the operators in the control room?

Inspection Questions

<table>
<tr><td colspan="2">Control Room Design</td></tr>
<tr><td>1.</td><td>How has human factors good practice been used to inform the design and layout of the control room?

Success Criteria

• human factors design standards and principles have been applied to the design of new control rooms
• for ageing assets with pre-existing control rooms there is evidence of assessment, or benchmarking, of control rooms against design criteria to determine opportunity for improvements
• equipment and human machine interfaces are arranged to support the performance of critical tasks e.g. critical controls and displays are located for ease of viewing and operation
• environmental factors (heat, light, noise) provide a suitable working environment
• consideration has been given to the arrangement of auxiliary equipment such as phones and radios in order to support tasks</td></tr>
<tr><td>2.</td><td>What tasks have been identified and analysed to ensure the human machine interface supports reliability?

Success Criteria

• Control room safety and environmentally critical tasks have been identified and analysed to demonstrate they can be performed reliably when required. There is specific focus on human machine interactions e.g. application of overrides,</td></tr>
</table>

	inhibits, changes to set points, monitoring process parameters and responding to abnormal situations ◦ some of these human machine interactions may be captured as sub-tasks as part of other HF analysis work e.g. safety-critical task analysis of a process start-up, or as a standalone analysis • what design features have been used to support reliable operator interaction with the control system in normal and upset conditions e.g. process overviews, trending, directing attention to critical information? • where improvement opportunities have been identified, they address the key issues, and are based on engineering, management and human factors good practice
3.	Are there clear established rules on access to and use of the control room such that unnecessary CRO distractions are minimised? **Success Criteria** • the control room environment is reserved for only essential personnel and there are well observed restrictions on non-essential visitors. Distractions from non-essential personnel are managed by locating unnecessary workstations, meeting areas and equipment in other locations of the installation or by providing appropriate partitions which minimise the potential for CRO distraction • non-essential communications are, so far as is practicable, directed away from the control room
Equipment Design	
3.	What other human machine interfaces are used while performing critical tasks? **Success Criteria** • critical tasks which include human machine interaction have been identified and analysed to demonstrate they can be performed reliably when required, with specific focus on human machine interactions. • human factors design principles includes spatial relationships between the panel and equipment it controls, intuitive layout and operation of controls and displays, clear and consistent labelling between controls, displays, procedures and physical equipment • for tasks where human failure could have a significant consequence, this has been accounted for in the design e.g. control shrouding, dual action operation, software security passwords, secure key system

3.I Alarm Management

Alarms, and additional information provided by the human machine interface (HMI), help operators understand, respond to, and regain control of process upsets before executive action by automated trips or emergency shutdowns (ESD) take effect. Alarm management is relevant to all operations of the offshore industry including, but not limited to, process control on production platforms, drilling operations and well control, marine control, lifting operations and dive control.

The objective of a well-designed alarm system should be to optimise successful human interaction with the system to enable operators to achieve accurate and timely fault diagnosis and alarm response. A good alarm system should provide clear and concise information to operators to enable them to recognise and respond to process conditions such as deviation from normal operating limits and abnormal events which require timely action or assessment.

When inspecting this topic factors to be considered should include

- does the alarm system support operators in identifying abnormal conditions and emergencies?
- are arrangements in place to monitor the performance of the alarm system?
- what training is provided to operator in the use and operation of the alarm system?
- what alarm response support is provided to operators?

Inspection Questions

<table>
<tr><td>1.</td><td>Are there any scenarios where control room operator response to alarms contribute significantly to safety e.g. operator response is relied upon in the absence of an instrumented safety system?

Success Criteria

• allocation of function between operator response and the instrumented safety system should be based on an assessment of risk associated with the scenario
• where operator response is relied upon the task has been analysed to demonstrate that it can be performed reliably when required</td></tr>
<tr><td>2.</td><td>How has human factors been considered in the design of the alarm system?

Success Criteria

• there is an established standard covering alarm system design. This has either been implemented or, if the alarm system pre-dates the standard, the system has been benchmarked against it to determine where improvements are necessary to improve alarm system performance
• the design of the alarm system incorporates human factors good practice. For example, typical design features would include
    o high priority alarms requiring response are designed to attract attention
    o an alarm overview is permanently visible to the control room operators
    o filters enable control room operators to quickly navigate and interpret alarms
    o making changes to the alarm system is controlled / restricted. e.g. inhibits, disabling, changing set points</td></tr>
</table>

3.	How is the performance of the alarm system monitored and maintained? **Success Criteria** • alarm system key performance indicators (KPIs) are established based on industry good practice. These are actively monitored and are used to inform targeted improvement projects • operators find the alarm system is manageable in normal and upset conditions
4.	What procedures exist to support reliable alarm response e.g. diagnosis and corrective action? **Success Criteria** • alarm response procedures should be readily available to the operator. These could be integrated within the HMI of the control system or in written form at the control station • as a minimum, alarm response procedures should include information on alarm cause, consequence of inaction, required operator action and allowable response time • alarm response procedures are useful to operators and follow human factors good practice design
5.	What training and competence arrangement are established to support reliable human performance when interacting with alarm system? **Success Criteria** • training and competence arrangements should be based on factors that make incorrect alarm responses more likely, and the consequences of an incorrect alarm response. For example, how often does a CRO get exposed to, or practice, handling less frequent or more unusual scenarios or alarms? Training assures capability to deliver alarm response procedures. This is particularly important for highly managed alarms • operators are confident that the training and competence system supports them to interact with the alarm system and deal with alarms

3.J Human Factors in Projects

Integration of human factors in new build or modification projects is essential for ensuring that human factors is appropriately considered during the design, construction and commissioning of engineering projects. Effective integration ensures that human factors engineering specifications and studies are incorporated within the project in order to optimise human performance and address the risk of human failure.

When inspecting this topic factors to be considered should include

- are project design requirements informed through both human factors engineering standards and human factors studies?
- how are human factors issues managed?
- who is responsible for managing human factors in the project?

Inspection Questions

1.	How has the required level of human factors involvement in the project been established? **Success Criteria** • human factors screening has been undertaken early enough in the project to identify key human factors priorities and to enable input into engineering design, procedures and training and competence. This has been used as the basis of a plan for the implementation of human factors as part of the project
2.	How is human factors managed for greenfield and brownfield modification projects? **Success Criteria** • human factors is integrated within, and managed throughout, the project lifecycle. Key human factors work packages as defined in human factors screening exercise have been planned into the project, and there is a system to track and manage identified actions • human factors requirements are identified through a combination of the application of established human factors engineering standards, ergonomic design principles and specific human factors studies (e.g. SCTA, valve criticality analysis, workload studies, HMI studies etc). • when determining if error reduction measures are reasonably practicable benchmarking against sound engineering judgement, management and human factors good practice is demonstrated
3.	What level of human factors specialist input has there been for the project? **Success Criteria** • the level of human factors expertise has been determined by the size and the scope of the project. Where there are human factors specialist studies, these should be lead and coordinated by a HF competent person • The human factors lead is consulted on key decisions relating to HF throughout the lifecycle of the project

3.K Human Factors in Decommissioning

Integration of human factors within decommissioning projects should be managed in much the same way of new build and modification projects, focusing on how existing human factors management arrangements are applied to the project to optimise human reliability.

When inspecting this topic factors to be considered should include

- how are human factors considered during the planning and execution of decommissioning activities?
- have any new human factors been introduced that need consideration such as new crew or teams, language barriers, new equipment and tasks?

Inspection questions

1.	How has human factors been considered as part of the decommissioning project?
	
	Success Criteria
	
	• HF strategy/plan
	• HF integration into risk assessment
	    o screening for safety critical tasks
	    o SCTA
	    o HAZOP/ID
	• HF competent resource
	• a screening exercise has been conducted to identify human factors which are relevant to the decommissioning project
	• there is a strategy in place to manage relevant HF topics which have been identified as relevant to the decommissioning project
	• there is a clear recognition that the nature of the installation MAH profile will change as the decommissioning project progresses and plans for the management of HF reflect this. For example
	    o more emphasis on SCTA when preparing to get hydrocarbon free
	    o more emphasis on supervision, safety critical communications and fatigue management when dismantling
	    o consideration of competence management requirements (i.e. increased presence of contractors onto the platform who may be unfamiliar with established rules and procedures)
	    o consideration of potential issues arising due to language barriers

2.	How has human factors has been considered for the process of making the installation hydrocarbon-free? **Success Criteria** • there should be a process of identifying and analysing safety-critical tasks associated with getting the installation hydrocarbon free • there should be evidence that a representative sample of these safety critical tasks have been subject to systematic predictive human error assessment (i.e. SCTA) to ensure that the potential for human error has been adequately considered as part of this work

	• procedures and systems of work for hydrocarbon freeing operations should align with human factors good practice and, where relevant, be informed by the findings of SCTA • there is evidence of adequate supervisory oversight to ensure that procedures are complied with

3.	How have human factors been considered for the management of operations up to cessation of production?
	
	Success Criteria
	
	• there is evidence of a management of change approach to assess both the potential risks and vulnerabilities brought by this change in operational status
	• there is evidence of a plan in place to manage any human and organisational factors associated with this change. For example
	    o safe staffing levels due to loss of key personnel
	    o competence or training requirements associated with changing tasks, or to fill gaps following loss of key personnel

Appendix 4 Application of EMM and Duty Holder Performance Assessment

When inspecting human factors, duty holder compliance is to be assessed against the relevant success criteria.

The success criteria have been determined from specific regulatory requirements, defined standards, established standards or interpretative standards.

This assessment will determine the EMM Risk Gap, the associated topic performance score together with the Initial Enforcement Expectation as shown in the table below. The initial enforcement expectation criteria differ slightly from the EMM for a 'Nominal' risk gap. This is because in practice '30' scores have been found to cover a wide range of risk gaps and a verbal warning would be an inappropriate enforcement response in many cases.

The actual enforcement may differ depending on local factors, **however, should this occur then the relevant local factors should be identified.**

Further guidance can be found at: http://www.hse.gov.uk/enforce/emm.pdf

EMM RISK GAP					
Extreme	**Substantial**	**Moderate**	**Nominal**	**None**	**None**
TOPIC PERFORMANCE SCORE					
60	**50**	**40**	**30**	**20**	**10**
Unacceptable	Very Poor	Poor	Broadly Compliant	Fully Compliant	Exemplary
EMM Initial Enforcement Expectation					
Prosecution / Enforcement Notice	Enforcement notice / Letter	Enforcement notice / Letter	Letter/Verbal warning	None	None

It should be noted that:

- the IG and hence the allocated scores may not cover all the matters that were considered during the intervention.

- the intervention may not necessarily have used every part of the IG. Consequently, the score only reflects what was inspected and the risk gap associated with the inspection findings.

- Where compliance gaps are found in two or more areas the overall score should not be less than the most significant risk gap identified. In addition, risks are cumulative, therefore risk gaps found in several areas need to be ‘added’ to ensure the overall risk is accounted for in the score. For example, two or three substantive scores of ‘30’ will point strongly to an overall score of ‘40’. There is currently no mathematical or other systematic process for doing this and inspectors must therefore use their judgement to allocate an appropriate score that best represents the overall inspection findings against this IG. The judgements made will be reviewed over time with the aim of establishing improved guidance for this activity.

Appendix 5 References / Further Reading

General

Assessment Principles of Offshore Safety Cases

Offshore Installations (Prevention of Fire and Explosion, and Emergency Response) Regulations

1995 L65 Approved Code of Practice and guidance

HSG48 Reducing Error Influencing Performance

Analysis of Safety and Environmentally Critical Tasks

Offshore technology report 1999/092 Human Factors Assessment of Safety Critical Tasks

Energy Institute - Guidance on human factors safety critical task analysis

Management of Procedures for Safety and Environmentally Criticality Tasks

HSE Information sheet on revitalising procedures

Managing Safety and Environmentally Critical Training and Competence

Managing competence for safety-related systems Part 1: Key guidance

Managing competence for safety-related systems Part 2: Supplementary material

Oil and gas UK: Guidelines on Competency for Wells Personnel – Issue 2

Energy Institute: Guidance on ensuring control room operator (CRO) competence

Fatigue Risk Management

HSG256 Managing Shift Work

HSE research report RR772 Offshore working time in relation to performance, health and safety. A review of current practice and evidence

IPIECA/IOGP: Managing fatigue in the workplace. A guide for the oil and gas industry

Energy Institute: Managing fatigue using a Fatigue risk management plan (FRMP)

Safety Critical Communications

Human factors: Shift handover

Human factors: Permit to work systems

Control Room and Equipment Design

ISO 11064 Ergonomic design of control centres, Parts 1-7

ISO 9241-210:2019 Ergonomics of human-system interaction - Part 210: Human-centred design for interactive systems.

EMMUA 201 Process plant control desks utilising Human-Computer Interfaces. A guide to design, operational and Human-Computer Interface issues

Alarm Management

EMMUA 191 Alarm Systems. A Guide to Design, Management and Procurement

BS EN 62682:2015 Management of alarms systems for process industries

Human Factors in Projects

Energy Institute: Report 454: Human factors engineering in projects

Staffing Levels and Workload

Energy Institute: Human factors briefing note no. 23 – Workload and staffing levels

HSE research report 348/2001 Assessing the safety of staffing arrangements for process operations in the chemical and allied industries ('The Entec Report')

Management of Organisational Change

HSE chemical information sheet CHIS 7 Organisational change and major accident hazards

Human Factors in Decommissioning

Energy Institute Human and organisational factors in end of service life and decommissioning

Human Factors Performance Indicators

Energy Institute Human factors performance indicators for the energy and related process industries

Energy Institute Enhancing human performance using process safety performance indicators

Energy Institute Human factors briefing note 17 Performance indicators

Appendix 6 - Glossary

Alarm philosophy	Guidelines which outline how to address all aspects of alarm management across all stages of the lifecycle of the system.
Allocation of function	A determination of which functions should be undertaken by a person, technology or a combination of the two.
Circadian Rhythm	The natural internal process that regulates the sleep-wake cycle.
Bio-mathematical modelling	A modelling tool used for predicting fatigue levels based on a pre-define algorithm and predicted or actual sleep/wake data factors which contribute to fatigue.
Ergonomics / Human Factors (HF)	The scientific discipline concerned with the understanding of interactions among humans and other elements of a system. The profession applies theory, principle, data and methods to design in order to optimise human well-being and overall system performance.
Human Error Probabilities	Numerical estimate of the likelihood of human error occurring throughout the completion of a safety critical task
Human-Machine Interface (HMI)	An interface which allows humans to interact with a machine, system or device.
Performance Influencing Factors (PIFs)	Contextual features of the task, working environment, management system or organisational structures which have an influence on the likelihood of human error.
Safety and Environmentally Critical Task (SECE)	Tasks or activities which are associated with Major Accident Hazard (MAH) or Major Accident to the Environment scenarios
Safety Critical Task Analysis (SCTA)	A structured Human Factors analysis method used to assess safety and / or environmentally critical tasks. SCTA incorporates task identification, prioritisation, task analysis and predictive human error analysis
Task Analysis	Structured technique which involves breaking a job, task or activity down into its discrete components to understand in depth the step-by-step detail of a task.
Predictive Human Error Analysis (PHEA)	Structure technique used in conjunction with Task Analysis in order to analyse human errors and performance influencing factors (PIFs) and identify areas for improvement such as engineering design, procedures and training.
Qualitative Analysis	Studies informed by observation and interviews to make sense of, describe and / or interpret, situations. A non-numerical exercise.
Quantitative Analysis	A process of collecting and analysing measurable numerical data to quantify behaviour.