SKA ORGANISATION HEALTH, SAFETY & ENVIRONMENTAL MANAGEMENT PLAN

Document Number SKA-TEL-SKO-0000740
Document Type .....PLAN
Revision 03
Author.....John Kerr
Date 2019-10-18
Document Classification ..... FOR PROJECT USE ONLY
Status.....Released

Name	Designation	Affiliation	Signature	
Authored by:				
John Kerr	Head of HSSE	SKAO	John Kerr	
			Date:	Oct 21, 2019
Owned by:				
John Kerr	Head of HSSE	SKAO	John Kerr	
			Date:	Oct 21, 2019
Approved by:				
Tim Stevenson	Head of Mission Assurance	SKAO	T. Stevenson	
			Date:	Oct 21, 2019
Released by:				
Phil Diamond	Director-General	SKAO	Philip Diamond	
			Date:	Oct 21, 2019

DOCUMENT HISTORY

Revision	Date Of Issue	Engineering Change Number	Comments
01	2017-03-21	-	First release
02	2019-04-26	-	Interim during Bridging
03	2019-10-18	-	Release for System CDR. Revised format to align with ISO standards. Environmental Management added.

DOCUMENT SOFTWARE

	Package	Version	Filename
Word processor	MS Word	Word 2007	SKA-TEL-SKO-0000740-03_HSE Management Plan
Block diagrams			
Other			

ORGANISATION DETAILS

Name	SKA Organisation
Registered Address	Jodrell Bank Observatory Lower Withington Macclesfield Cheshire SK11 9DL United Kingdom Registered in England & Wales Company Number: 07881918
Fax.	+44 (0)161 306 9600
Website	www.skatelescope.org

TABLE OF CONTENTS

1 INTRODUCTION 8
1.1 Purpose of the document 8
1.2 Scope of the document 8
2 REFERENCES 10
2.1 Applicable documents 10
2.2 Reference documents 10
3 DEFINITIONS 12
3.1 General 12
3.2 List of definitions 12
4 CONTEXT OF THE SKA ORGANISATION 13
4.1 The SKA Organisation and its context 13
4.2 Needs and expectations of interested parties 14
4.2.1 Employer duties 14
4.2.2 Employee duties 14
4.3 Scope of environmental and sustainability management system 14
4.4 Safety Management System 15
4.4.1 Procurement Phase (including possible 'in-kind' contributions) 16
4.4.2 'Construction' Phase(s) (Build / Erection / Installation) 16
4.4.3 Operations Phase(s) (including 'Handover' Operations) 17
5 LEADERSHIP 17
5.1 Leadership and commitment 17
5.2 HSE Policies 18
5.3 Organisational roles, responsibilities and authorities 18
5.3.1 SKAO HSE Framework 19
5.3.1.1 SKAO Design Deliverables 19
5.3.1.2 SKAO Construction, Integration and Verification activities 21
5.3.1.3 SKAO Operations 21
5.3.2 SKA1 HSE Roles and Responsibilities – Construction phase 22
5.3.2.1 SKAO Director-General 22
5.3.2.2 Head of Health, Safety, Security and Environmental (HoHSSE) 22
5.3.2.3 SKA NEC4 Project Manager 23
5.3.2.4 SKAO NEC4 Supervisor 23
5.3.2.5 SKAO HSE Manager(s) 24
5.3.2.6 SKAO Site Health & Safety Officer(s) 24
5.3.2.7 SKAO Site Environmental Officer(s) 24
5.3.2.8 Integrating Organisation/Professional Services Provider (consultant) 25
5.3.2.9 Contractors 26
5.3.2.10 Site Owner 29
5.4 Consultation and participation of workers 29
6 PLANNING 29
6.1 Actions to address risks and opportunities 29
6.1.1 General 29
6.1.2 Hazard identification and assessment of risks and opportunities 30
6.1.2.1 Hazard identification 30
6.1.2.2 Assessment of HSE risks and other risks to the HSE system 31
6.1.2.3 Assessment of HSE opportunities and other opportunities to the Integrating Organisation HSE management system 32
6.1.3 Determination of legal requirements and other requirements 32
6.1.4 Planning action 33
6.2 HSE objectives and planning to achieve them 33
6.2.1 HSE objectives 33
6.2.2 Planning actions to achieve HSE objectives 34
7 SUPPORT 35
7.1 Resources 35
7.2 Competence 35
7.3 Awareness 38
7.4 Communication 38
7.4.1 General 38
7.4.2 Internal Communication 39
7.4.3 External Communication 39
7.5 Documented information 39
7.5.1 General 39

7.5.2 Creating and updating 40
7.5.3 Control of documented information 40
8 OPERATIONS 40
8.1 Operational planning and control 40
8.1.1 General 41
8.1.2 Eliminating hazards and reducing HSE risks 41
8.1.3 Management of change 42
8.1.4 Procurement 42
8.1.4.1 General 42
8.1.4.2 Contractors 42
8.1.4.3 Outsourcing 42
8.2 Emergency preparedness and response 43
8.2.1 General 43
8.3 Engineering Operations Forums 43
8.3.1 Engineering Operations Safety Work Groups 44
9 PERFORMANCE EVALUATION 45
9.1 Monitoring, measurement, analysis and evaluation 45
9.1.1 General 45
9.1.2 Evaluation of compliance 45
9.2 Internal audit 46
9.2.1 General 46
9.2.2 Internal audit programme 46
10 IMPROVEMENT 47
10.1 General 47
10.2 Incident, nonconformity and corrective action 47
10.3 Continual improvement 49
10.4 Future Project Lifecycle considerations 49
11 SOFTWARE AND SAFETY 49
11.1 Hardware-based hazard control 50
11.2 SKAO interpretation of [RD4] MIL-STD-882E - Standard Practice System Safety 50
11.2.1 Level 5 Software Control Category – No Safety Impact 50
11.2.2 Level 4 Software Control Category - Influential 50
11.2.3 Level 3 Software Control Category – Redundant Fault Tolerant 50
11.2.4 Level 1 or 2 Software Control Category – Autonomous or Semi-Autonomous 50
11.3 Future review 50
12 FUNCTIONAL SAFETY 51
12.1 Introduction 51
12.2 Functional Safety 51
12.2.1 Definition of functional Safety 51
12.2.2 Safety functions and safety-related systems 51
12.2.3 Example of functional safety 52
12.2.4 Challenges in achieving functional safety 52
12.3 IEC 61508 – Functional Safety of E/E/PE safety-related systems 52
12.3.1 Objectives 53
12.3.2 E/E/PE safety-related systems 53
12.3.3 Technical Approach 54
12.3.4 Safety integrity levels 54
12.3.5 Example of functional safety revisited 54
12.4 IEC 61508 – Functional Safety of non- E/E/PE safety-related systems 54
12.4.1 Mechanical 54
12.4.2 Environmental 55
13 PROCUREMENT 55
13.1 Introduction 55
13.2 Pre-qualification 55
13.3 Suppliers H&S Policy 56
13.4 Suppliers Environmental Policy 56
13.5 Tender 56
13.6 Contract 57
13.7 Site Works Planning 57
14 CONSTRUCTION SITE RISK MANAGEMENT OF HSE 58
14.1 HSE Plans 58
14.2 Environmental Management Plans 58
14.2.1 WBS-level Environmental and Sustainability Management System 58
14.2.2 Project Environmental Management Plan (project EMP) 58
14.2.3 Contractor Environmental Management Plan (contractor EMP) 59
14.3 HSE Integrated Plans 59
14.3.1 Noise and vibration 59
14.3.2 Light 60

14.4 Risk Assessments/System of Work and Method Statements 60
14.5 Specific health & safety hazards 60
14.6 Specific environmental hazards and risks 60
14.7 Procurement and supply chain management 61
14.8 Worker involvement 61
14.9 Monitoring and reporting 61
14.10 Audit and assurance 61
14.11 Emergency preparedness and response 61
15 CONSTRUCTION SITE MANAGEMENT OF HSE 62
15.1 Access to site 62
15.2 Site introduction 62
15.3 Contractor inductions 62
15.4 Visitors 62
15.5 Drivers 63
15.6 Supplier personnel 63
15.7 Supervision 63
15.8 Inspections 63
15.9 General behaviour 63
15.10 Alcohol and drugs 64
15.11 Smoking 64
15.12 Personal telephones, radios and audio equipment 64
15.13 Communications – Oral and Written English 64
15.14 Control of Hours Worked 65
15.14.1 Working Time Regulations 65
15.15 Removal of Suppliers personnel from site 65
15.16 Monitoring, Auditing, Investigations 65
15.17 Transport 65
15.17.1 Construction Transport Management Plan 65
16 INTEGRATION & VERIFICATION / ENGINEERING COMMISSIONING 65
17 HEALTH, SAFETY AND ENVIRONMENTAL CULTURE 66
17.1 Leadership and commitment 66
17.2 Continual Improvement 67
17.3 Monitoring 67
17.3.1 Proactive HSE measures 67
17.3.2 Reactive HSE measures 67
17.4 Celebrating Success 68
17.4.1 Giving feedback 68
17.4.2 Letters from leaders and managers 68
17.4.3 Newsletters 68
17.4.4 Taking ideas forward 69
17.4.5 Workforce heroes 69
17.4.6 Formalised award programme 69
Appendix 1: SKAO Health, Safety and Environmental Policy Statement 70
Appendix 2 - Core criteria for demonstration of competence 72
Appendix 3 – Health, Safety and Environmental aims and indicators 81
Appendix 4 – Design Risks 84
Appendix 5 – Management of construction phase Health & Safety hazards and risks 85
Appendix 6 – Management of construction phase environmental hazards and risks 96
Appendix 7 – Construction Phase Health & Safety Plan (CPHSP) 99
Appendix 8 – Construction Phase Environmental Management Plan 102
Appendix 9 – Construction site – work methods 105
Appendix 10 – Construction site – plant and equipment 106
Appendix 11 – Alcohol and Drugs Policy 110
Appendix 12 – Health, Safety and Environmental Management Database (HMD) 112
Appendix 13 – Plan for the future review and revision of the HSE Plan 115

LIST OF FIGURES

Figure 1: Schematic of proposed activities during SKAO Operations phase 14
Figure 2: SKAO HSE structure and inter-relationships 19
Figure 3: Project HSE Plans and Policies 20
Figure 4: HSE interfaces during SKAO Construction phase 21
Figure 5: Document hierarchy and responsibilities for HSE management arrangements on SKA1 sites 22
Figure 6: Example Engineering Operations Forum structure. 44
Figure 7: Document hierarchy and responsibilities for environmental management arrangements on SKA1 sites. 59

LIST OF TABLES

Table 1 : Example Construction Monitoring Plan 46

LIST OF ABBREVIATIONS

AD.....Applicable Document

ASKAP.....Australian Square Kilometre Array Pathfinder

CDR.....Critical Design Review

CPHSP……Construction Phase Health & Safety Plan

CSIRO……..Commonwealth Scientific and Industrial Research Organisation

E/E/PE……Electrical/electronic/programmable electronic

DoD .....Department of Defence

EMC……Electro-magnetic Compliance

EMI……Electro-magnetic Interference

EMP .....Environmental Management Plan

ESMS……Environment and Sustainability Management System

EOC.....Engineering Operations Centre

FMECA.....Failure Mode Effects & Criticality Analysis

HMD……Health, Safety & Environmental Management Database

HAZCOMM……Hazards in Commissioning

HAZCON……Hazards in Construction

HAZOP……..Hazard and Operability

HSR……..Hazard Safety Register

ITF.....Integration Test Facility

LOW.....LOW Telescope in Australia

MDAL……..Main Data Assumption List

MeerKAT .....64 dish array South African SKA precursor

MID.....MID Telescope in South Africa

PBS .....Product Breakdown Structure

PEP .....Project Execution Plan

PPE .....Personal Protective Equipment

PSC .....Project Safety Committee

RAMS* .....Risk Assessment / Method Statement

RD.....Reference Document

RFI…….. Radio Frequency Interference

SARAO……South African Radio Astronomy Observatory

SCC .....Software Control Categories

SOC.....Science Operations Centre

SKA .....Square Kilometre Array

SKAO.....Square Kilometre Array Organisation (and its successors)

TBC .....To Be Confirmed

TBD.....To Be Determined

TBW .....To Be Written

*** We note that RAMS is an acronym previously used indicating "Reliability, Availability, Maintainability and Safety". For the purposes of this Plan the commonly used HSE definition "Risk Assessment / Method Statement" will be retained.**

1 Introduction

The SKA Organisation and its staff are committed to being a leader in health, safety and environmental management.

1.1 Purpose of the document

SKAO is committed to protecting personnel from accidental death, injury, or occupational illness and safeguarding systems, infrastructure, and property from accidental destruction, or damage while executing its engineering and science requirements.

We shall integrate good health, safety and environmental performance as a core element in every planning, design and construction operation to achieve our aim of being safe and secure.

The protection of the health and safety of everyone involved in or affected by our work, and the protection of the local and global environment is important to us.

Health, safety and environmental performance will be given the highest priority at all times by systematically identifying, assessing and managing HSE risks, monitoring our performance against targets and publishing the results.

We shall engage with all our staff, partners, stakeholders and suppliers so that everyone is enthusiastically involved in managing risk, securing success and acting as an ambassador for our realistic and practical vision.

This HSE Management Plan ('the Plan') is to serve as a vehicle to communicate the high-level quantitative and qualitative characteristics of the approach to safety and environmental protection to be taken by the Office of the SKA Organisation ("SKAO").

It describes the roles/responsibilities, competence requirements and methods for HSE implementation by all SKAO and contractors / consultants / suppliers.

The Plan mainly draws on requirements from [RD2] Occupational Health and Safety Management Standard ISO 45001:2018 and [RD3] Environmental Management Standard 14001:2015. It is also inspired by similar plans from other major telescope projects.

The existing work of the SKA precursor and pathfinder telescope sites (including ASKAP and MeerKAT) in the area of operational safety management are acknowledged and referenced with a view to incorporating best practice, lessons learned and coordination.

There are no security, intellectual property, or privacy considerations attached to the use or distribution of this document.

1.2 Scope of the document

The Plan shall apply to any activity relating to design development (cumulating in System CDR) and procurement, with future revisions focusing on the transition to procurement/acquisition, construction/manufacturing and operational/maintenance phases.

It is intended to relate to physical or virtual work developed in any science, engineering or manufacturing sense.

In some project documentation reference may have been made to a 'Health and Safety Plan(s)' or equivalent – for the sake of clarity this term can be considered equivalent to the HSE Management Plan.

NOTE: **Different National statutes have a variety of Safety acronyms such as H&S, HSE, OHS and SHE. The SKAO recognises these terms are frequently interchangeable. Provided a reasonable and logical equivalence can be demonstrated and agreed with SKAO HoHSSE, we do not intend that our partners, stakeholders or suppliers radically amend language used in their existing safety documentation. Generally the use of the word "safety" should be considered synonymous with 'health and safety' for the purpose of reading and understanding this document.**

Owing to the diversity of engineering cultures present in the participating organisations, and the cost and risk of supplanting satisfactory existing practices where these are established, the Plan does not seek to invoke unnecessary change – only to emphasise and re-iterate principles.

A new revision of this Plan will normally be issued on at least a once per year and therefore must ensure a forward look to forthcoming phases of the SKA – a schedule of revisions for this HSE Plan is proposed in Appendix 13.

Each stakeholder organisation shall write a specific HSE Plan for their respective activity, considering this Plan and calling upon appropriate applicable and reference documents. These HSE Plan(s) shall be issued to the relevant line management authority for review and acceptance before any significant work activities start, if not already issued previously. Note: the term "organisation" is used extensively to represent any partner or stakeholder (e.g. contractor / consultant / supplier) involved in the SKA project.

It is inevitable that some overlap between safety risks (safety hazards) and the project risk management activity will occur. The important thing is that all significant safety hazards have visibility to senior managers who are responsible for project risk but that also ALL safety hazards have visibility to the overall SKAO Head of Health, Safety, Security & Environmental (HoHSSE).

Similarly it is inevitable that some overlap between safety hazard management and product safety will occur. **Product safety is an integral part of product assurance and therefore the product safety *detail* requirements of the SKA Product Assurance Plan [AD4] shall interpret and at the detailed level take precedence over this document**. It is however proposed in this document that the HSE Plan should take the highest priority in the hierarchy of safety subject to compliance with applicable national regulation.

In the case of Product Safety therefore, the HSE Plan high level requirements should be compatible with the SKA Product Assurance Plan but the detailed requirements for product safety will be found and referenced in this latter plan.

Other risk areas such as the quality assurance and asset integrity can be expected to appear in the output from safety hazard analysis. It is an objective of the SKA to ensure the highest levels of quality performance in the planning, the design and the implementation of the SKA.

2 References

2.1 Applicable documents

The following documents are applicable to the extent stated herein. In the event of conflict between the contents of the applicable documents and this document, **the applicable documents** shall take precedence.

Global

[AD1] SKA Project Execution Plan SKA-TEL-SKO-0001100,
[AD2] SKA System Engineering Management Plan SKA-TEL-SKO-0000024,
[AD3] SKA Phase 1 System Requirements Specification SKA-TEL-SKO-0000008,
[AD4] SKA Product Assurance Plan - SKA-TEL-SKO-0000739,
[AD5] SKA EMI/EMC Standards & Procedures, SKA-TEL-SKO-0000202,

South Africa

[AD6] Occupational Health and Safety Act, Act 85 of 1993,
[AD7] Construction Regulations 2014,
[AD8] National Environmental Management Act (NEMA), Act 107 of 1998 and amendments,

Australia

[AD9] Work Health and Safety Act 2011,
[AD10] Work Health and Safety Regulation 2011,
[AD11] Environmental Protection and Biodiversity Conservation Act (EPBA Act) 1999,
[AD12] Environmental Protection Act 1986 (WA) (EP Act),

United Kingdom

[AD13] Health & Safety at Work Act 1974,
[AD14] Management of Health and Safety at Work Regulations 1999,
[AD15] Environment Act 1995.

2.2 Reference documents

The following documents are referenced in this document. In the event of conflict between the contents of the referenced documents and this document, **this document** shall take precedence.

Global

[RD1] SKAO Health, Safety and Environmental Policy SKA-GOV-000063,
[RD2] ISO 45001:2018, Occupational health and management systems – Requirements,
[RD3] ISO 14001:2015, Environmental Management systems - Requirements,
[RD4] MIL-STD-882E_DOD, Department of Defence Standard Practice System Safety,
[RD5] ECSS Secretariat, “Space product assurance - Hazard analysis”, ECSS-Q-ST-40- 02C, 15 November, 2008,
[RD6] IEC 61508:2010 – Functional safety of electrical/electronic/programmable electronic safety-related systems,
[RD7] SKA1 Operations Plan SKA-TEL-SKO-0001012,
[RD8] SKA1 Safety in Design Compliance Report - SKA-TEL-SKO-0001059,
[RD9] SKA1 WBS Dictionary - SKA-TEL-SKO-0001101,
[RD10] SKA1 Integrated Project Schedule - SKA-TEL-SKO-0001103,
[RD11] SKA1 Project Engineering Management Plan - SKA-TEL-SKO-0001201,
[RD12] SKA1 Procurement Policy – SKA-GOV-00000069,
[RD13] SKA1 Procurement Procedure – SKA-GOV-00000070,
[RD14] NEC®4 Engineering and Construction Contract, 4th edition June 2017,

South Africa

[RD15] MeerKAT Science SKA1 Construction Interferences Management Plan SKA-TEL-SKO-0000975,
[RD16] Site Information & Instructions: SKA1_MID, SKA-TEL-SKO-0001040,
[RD17] SARAO SHE policy,
[RD18] SKA-SA SHE Management Policy Manual SSA1700-0000-MP-1,
[RD19] SKA1 MID Infrastructure& Power Occupational Health & Safety Specification for Construction SKA-TEL-INSA-0000040,
[RD20] South Africa - Integrated Environmental Management Plan for the South African mid-frequency array of SKA Phase 1 2018-2023,
[RD21] INSA Environmental Management Plan SKA-TEL-INSA-0000041,

Australia

[RD22] Construction Interferences Management Plan (TBW),
[RD23] Site Information Document & Instructions (TBW),
[RD24] CSIRO Health, safety and environmental sustainability policy,
[RD25] NOT USED
[RD26] Murchison Radio-Astronomy Observatory – HSE and Operational Management for Guest Users,
[RD27] INAU Health and Safety Management Plan - SKA-TEL-INAU-0000026,
[RD28] Environmental Management Plan for SKA-LOW (TBW).

United Kingdom

[RD29] SKAO Office Health & Safety Plan – SKA-GOV-0000065,

[RD30] SKAO Business Continuity Plan – SKA-GOV-0000066.

3 Definitions

A definition of Safety: Freedom from conditions that can cause death, injury, occupational illness, damage to or loss of equipment or property, or damage to the environment.

3.1 General

Although the following list of definitions has largely been drawn from [RD4] the USA Department of Defence System Safety Standard document the definitions are not intended to be prescriptive.
Provided an equivalence can be demonstrated and agreed with SKAO HoHSSE, suitable alternatives may be used by SKAO partners, contractors and suppliers. Equivalent terminology to national Acts, Regulations and Standards is encouraged.

3.2 List of definitions

Acceptable Risk. Risk that the appropriate acceptance authority is willing to accept without additional mitigation.

Causal factor. One or several mechanisms that trigger the hazard that may result in a mishap.

Environmental impact. An adverse change to the environment wholly or partially caused by the system or its use.

Event risk. The risk associated with a hazard as it applies to a specified hardware/software configuration during an event.

Firmware. The combination of a hardware device and computer instructions or computer data that reside as read-only software on the hardware device. The software cannot be readily modified under program control.

Hazard. A real or potential condition that could lead to an unplanned event or series of events (i.e. mishap) resulting in death, injury, occupational illness, damage to or loss of equipment or property, or damage to the environment.

Initial risk. The first assessment of the potential risk of an identified hazard. Initial risk establishes a fixed baseline for the hazard.

Level of rigour (LOR). A specification of the depth and breadth of software analysis and verification activities necessary to provide a sufficient level of confidence that a safety-critical or safety-related software function will perform as required.

Life-cycle. All phases of the system's life, including design, research, development, test and evaluation, production, deployment (inventory), operations and support, and disposal.

Mishap. An event or series of events resulting in unintentional death, injury, occupational illness, damage to or loss of equipment or property, or damage to the environment. For the purposes of this Standard, the term "mishap" includes negative environmental impacts from planned events.

Mitigation measure. Action required to eliminate the hazard or when a hazard cannot be eliminated, reduce the associated risk by lessening the severity of the resulting mishap or lowering the likelihood that a mishap will occur.

Mode. A designated system condition or status (e.g., maintenance, test, operation, storage, transport).

Monetary Loss. The summation of the estimated costs for equipment repair or replacement, facility repair or replacement, environmental clean-up, personal injury or illness, environmental liabilities, and should include any known fines or penalties resulting from the projected mishap.

Probability. An expression of the likelihood of occurrence of a mishap.

Risk. A combination of the severity of the mishap and the probability that the mishap will occur.

Risk level. The characterization of risk as either High, Serious, Medium, or Low.

Safety. Freedom from conditions that can cause death, injury, occupational illness, damage to or loss of equipment or property, or damage to the environment.

Safety-critical. A term applied to a condition, event, operation, process, or item whose mishap severity consequence is either Catastrophic or Critical (e.g., safety-critical function, safety-critical path, and safety-critical component).

Severity. The magnitude of potential consequences of a mishap to include: death, injury, occupational illness, damage to or loss of equipment or property, damage to the environment, or monetary loss.

Software system safety. The application of system safety principles to software.

System. The organisation of hardware, software, material, facilities, personnel, data, and services needed to perform a designated function within a stated environment with specified results.

System-of-systems. A set or arrangement of interdependent systems that are related or connected to provide a given capability.

System safety. The application of engineering and management principles, criteria, and techniques to achieve acceptable risk within the constraints of operational effectiveness and suitability, time, and cost throughout all phases of the system life-cycle.

System safety management. All plans and actions taken to identify hazards; assess and mitigate associated risks; and track, control, accept, and document risks encountered in the design, development, test, acquisition, use, and disposal of systems, subsystems, equipment, and infrastructure."

Stakeholder. Employee, customer, or any person involved with the SKAO whom therefore has a responsibility towards it and an interest in its success. Equally therefore applying to any person involved with any organisation involved in the SKA whom therefore has a responsibility towards it and an interest in its success for the duration of their involvement.

4 Context of the SKA Organisation

It is acknowledged that the SKA Host Countries' existing operational observatories have developed and can make available extensive libraries of safety related plans, procedures and documents. These may be used or developed by the SKA Observatory where appropriate in preference to starting from scratch.

4.1 The SKA Organisation and its context

At time of writing this revision of the HSE Plan it is envisaged that CSIRO and SARAO should be viewed as "part of the SKA" and their relationship with the SKAO should not be governed via SLA.

At time of writing this HSE Plan it envisaged this will be expedited via an Operations Collaboration Agreement (commonly referred to as Operations Agreement).

Such a "partnership" will not only foster good will and ownership, it will also mitigate potential conflicts of interests.

In particular, the Operations Agreements (or any other relevant implementation agreement) should allow SKAO staff and CSIRO/SARAO staff to coexist in the same management chain, "reporting" ultimately to the SKAO DG. This will mean that CSIRO can be an employer of SKA staff in Australia and SARAO can do the same in South Africa.

The staff would be employed by CSIRO/SARAO and under their governance for legal aspects of their employment (H&S, pay etc.), but their SKA duties/objectives and input on their performance shall be from a management chain that connects directly to the SKA DG.

The two telescope sites should have a mix of staff that are employed both by CSIRO/SARAO (under IGO authority) *and* by the IGO itself. The IGO staff should be able to be deployed at any of the three sites and the flexibility should exist to migrate them with time as the situation evolves. This could be implemented through a concept of "tours of duty". This scheme could even be extensible to allow more than one employer locally (e.g. CSIRO and ICRAR).

Additionally, the tour of duty concept will naturally allow staff from the other participating countries to be stationed at any of the three sites. This in turn will foster the transfer of knowledge, strengthen the "one observatory" concept, and give opportunities for all SKA partner countries to engage fully.

The Telescope Site Directors shall be IGO employees reporting directly to the Director of Operations (who in turn reports directly to the Director-General). This will ensure accountability to the Director-General. The Telescope Site Directors should have the delegated authority and autonomy to make the day to day decisions needed to operate in an efficient way.

In this model the Telescope Site Directors lead the site staff directly, removing the need for a second locally employed operations director

The proposed organisational chart (during Operations Phase) for this model is shown in Figure 1 below:

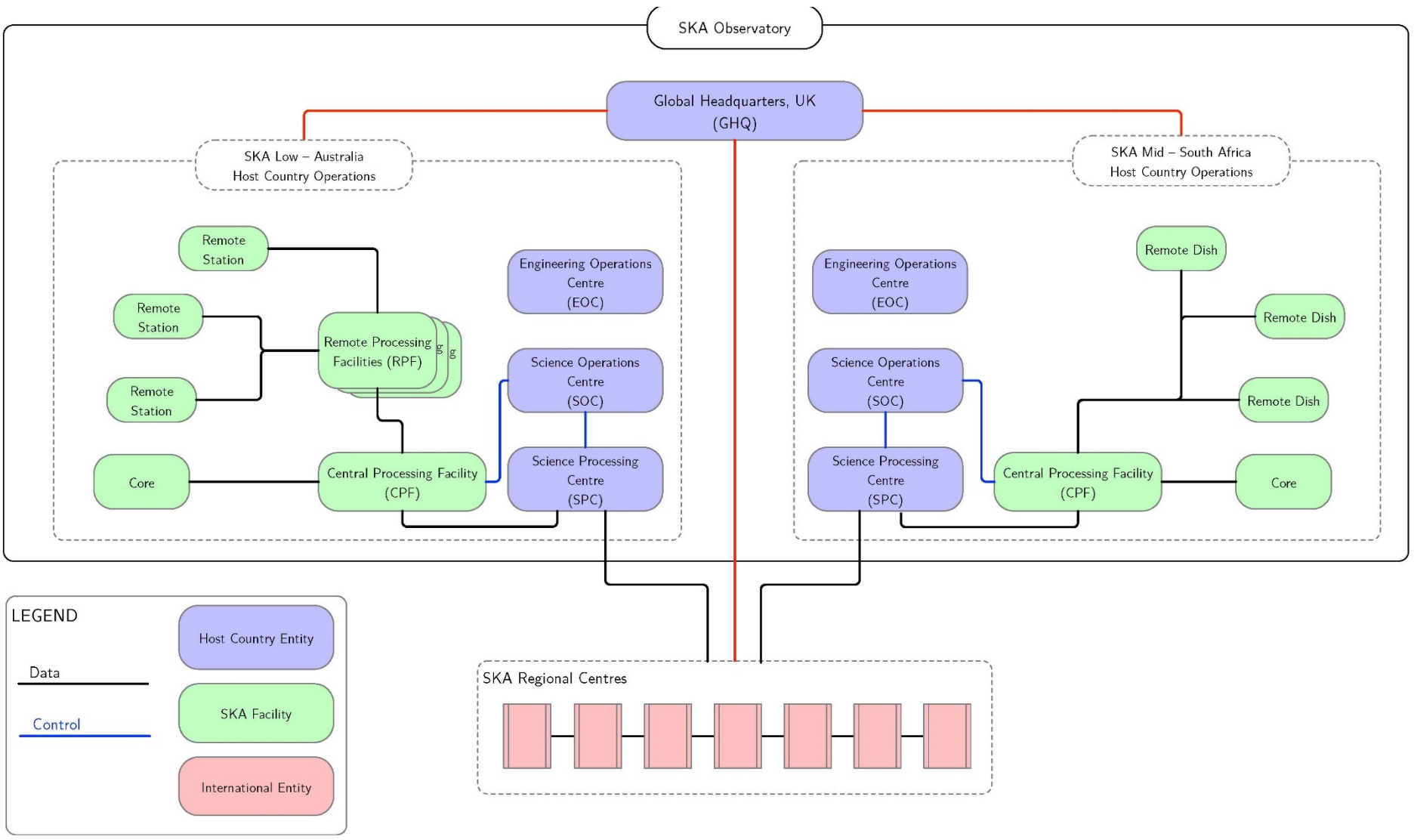


Figure 1: Schematic of proposed activities during SKAO Operations phase

4.2 Needs and expectations of interested parties

4.2.1 Employer duties

National Statutes mandate an employer to appoint one or more competent people to help them implement the measures they need to take. The competent person should focus on the significant risks and those with serious consequences.

Every partner, contractor and supplier will have its own risk profile. In some businesses the risks will be tangible and present immediate hazards whereas in other businesses the risks may be health related and illnesses may not become apparent for some time.

A risk profile examines:

- The nature and level of safety threat facing an organisation.
- The likelihood of adverse effects occurring.
- The level of disruption and costs associated with each type of risk.
- The effectiveness of controls in place to manage those risks.

On multi-employer workplaces, organisations shall implement a process for coordinating the relevant parts of their HSE management system with other organisations.

4.2.2 Employee duties

National Statutes mandate employees to:

a) Take reasonable care of their own safety and that of others who may be affected by their actions.
b) Follow the training they have received when using any work items their employer has given them and not to undertake any tasks that they are not trained and authorised for.
c) Co-operate with their employer on health and safety and work in accordance with the employer's procedures.
d) Tell someone (their employer, supervisor or health and safety representative) if they think the work or inadequate precautions are putting anyone's health and safety at serious risk.

4.3 Scope of environmental and sustainability management system

At time of writing this revision of the HSE Plan the scope of the future ESMS is dependant on finalisation of Operational Collaboration Agreements. It is anticipated these will be concluded and specific ESMS details articulated in future revision 4 of this HSE Plan (refer Appendix 13).

The SKAO and its partner organisations shall establish, implement, maintain and continually improve an environmental management system(s), including the processes needed and their interactions, in accordance with the relevant requirements of this document, applicable aspects of host country integrated environmental management plans [RD20] and [RD28] as well as [RD3] ISO 14001 (or equivalents).

The scope of this SKAO environmental management system includes everything under the SKAO's control or influence that could impact on its environmental performance. The credibility of the SKAO's environmental management system will largely depend on the extent of the defined boundaries. Under no circumstances should the scope be used to exclude activities, products or services that have or could have the potential to impact the SKAO's environmental performance or evade its compliance requirements.

The SKAO will maintain the scope of the environmental management system as documented information and make it available to interested parties. The method of maintaining the scope is not prescribed by [RD3] ISO 14001, therefore the SKAO will need to determine the most suitable method, e.g. using a written description, inclusion on a site map, an organisational diagram, a webpage, or posting a public statement of its conformity.

4.4 Safety Management System

The basis of the H&S management system approach applied in this HSE Management Plan is compliant with [RD2] International Standard ISO 45001.

The SKAO, Integrating Organisation and its partner and supplier organisations shall establish, implement, maintain and continually improve relevant HSE management system(s), including the processes needed and their interactions, in accordance with the requirements of this document and [RD2] ISO 45001 (or equivalents).

HSE management systems will reflect the context of the SKAO, be proportionate to its size and complexity and be properly resourced.

Our HSE management system should be viewed as an organizing framework that should be continually monitored and periodically reviewed to provide effective direction for an organisation's responses to changing internal and external issues.

During the forthcoming SKA1 construction phase the Integrating Organisation HSE management system will be aligned and integrated with other business processes to ensure that HSE performance is not compromised in order that other business objectives can be achieved, e.g. sacrificing health and safety at the expense of achieving productivity objectives.

It is imperative that our HSE requirements are aligned and integrated with the SKAO's management practices and business processes. For example, if the SKAO conducts an annual strategic review of its market position, customer needs and expectations, and business performance, then it is more effective to incorporate an understanding of the internal and external issues that can impact on its HSE performance, interested party needs and expectations, and HSE performance into that process. By doing so, HSE issues can be evaluated in light of the SKAO's strategy, and HSE initiatives can be aligned with other business imperatives.

In general terms this HSE Plan incorporates the **Plan-Do-Check-Act (PDCA) concept**, which requires leadership, commitment and participation of workers, and where they exist, workers' representatives, from all levels and functions of the SKAO including its suppliers.

The HSE Plan does not include requirements specific to other management systems, such as those for quality, security or financial management, though its elements can be aligned or integrated with those of other management systems.

PDCA is an iterative process used to achieve continual improvement and is applied to a management system and to each of its individual elements, as follows:

Plan: Describe how to manage HSE in the SKAO / partner / supplier organisations and plan to make it happen in practice. Establish objectives, programmes and processes necessary to deliver results in accordance with [RD1] SKAO HSE policy.
Do: Prioritise and control risks – consulting staff and wider stakeholders. Implement the processes as planned.
Check: Measure how one is doing. Monitor and measure activities and processes with regard to the HSE policy and objectives, and report the results.
Act: Learn from experience. Take actions to continually improve the HSE performance to achieve the intended outcomes.

The following objectives are central to this HSE Plan:

a) To ensure the inclusion of HSE criteria in the design of the SKA,
b) To ensure that HSE requirements are clearly communicated and that the 'Plan, Do, Check and Act' method becomes second nature for those actively involved in the management of health, safety & environmental issues,
c) To ensure that the processes and tools supporting the management of HSE issues are fit for purpose,
d) To ensure that the SKAO HSE Policy commitments are met and or exceeded for the wider project,
e) To ensure that the roles and responsibilities for the management of HSE are clearly communicated to all those involved in the project,
f) To ensure that continual improvement is core to developing this (and all) HSE Plan(s) and to increasing the effectiveness of the project's general safety culture.
g) To ensure that Integrating Organisation / partner / supplier organisations' HSE Plans can meet or exceed the requirements of this SKAO HSE Plan (by virtue of following and acting on this Plan) and are acceptable to the SKA host countries or individual SKAO countries in their evaluation of meeting or exceeding the applicable local and national laws.

SKAO Partners and suppliers should take all necessary steps to ensure that workplace HSE practices meet or exceed applicable local and national laws, including preparing an acceptable HSE management plan.

4.4.1 Procurement Phase (including possible 'in-kind' contributions)

This phase includes supplier selection and contract award.
For the purposes of this HSE Plan the term "suppliers" includes, but is not limited to, any and all Tier 1 Work Package Contractors, sub-contractors and consultants.
The procurement phase also includes the subsequent manufacture, test and test phases corresponding to the manufacturing of sub-element components or sub-systems.
The phase may include the 'in-kind' introduction or transfer of existing functional assets to the SKA. It will include the transportation of goods and equipment between countries and normally to technical centres within host countries for further storage, assembly, integration and test activities.

The main documents to be used in support of the Procurement Phase will be developed in future iterations of this HSE Plan (refer to Appendix 13).
Further detailed HSE Procurement requirements are provided in section 13 of this HSE Plan.

Attention is drawn to the requirements of Appendix 2 – Core criteria for demonstration of competence which are of particular relevance to supplier pre-qualification selection and tender appraisal.

4.4.2 'Construction' Phase(s) (Build / Erection / Installation)

This phase normally concerns the activities on site, where 'site' is normally a host country telescope site. The phase will also concern a contractor's / supplier's site outside of the host countries where SKA work is being developed (such as assembly, integration and test) for example a technical laboratory for a sub-element sub-assembly. This phase will include the transportation of goods and equipment between countries and normally finishing at the telescope(s) site(s).

At time of writing this revision of this HSE Plan it is envisaged that an Integrating Organisation, Tier 1 Work Package Contractors and suppliers will mostly be responsible for building SKA1, under the supervision of SKAO project personnel. Said Integrating Organisation will be appointed by the SKAO (via an NEC4 Professional Services Contract) to coordinate and, in liaison with relevant SKAO NEC Project Managers, control the construction phase of any phase of the project involving more than one Tier 1 or Tier 2 contractor.

Engineering commissioning and acceptance will also create a significant amount of work.

The anticipated main HSE duties of an Integrating Organisation are articulated in section 5.3.2.8 of this HSE Plan.

The main HSE duties will generally include, but not be limited to, the following:

- In liaison with SKAO HSE Manager and Officers, supported by the SKAO NEC Project Manager, the Integrating Organisation's HSE manager and Tier 1 Work Package contractors site HSE officer(s) who shall, variously, review and update the hazard analysis and the hazard database ensuring that all practical measures are taken to eliminate or reduce all hazard risks to ALARP.
- In liaison with SKAO HSE Manager and Officers, supported by the SKAO NEC Project Manager, the Integrating Organisation's HSE manager and the Tier 1 Work Package contractors site HSE officer(s), shall review and update (where necessary) supplier's site safety manual(s).
- The SKAO DDG and the SKAO HoHSSE who will appoint relevant persons to carry out safety inspections and/or audits.
- Contractors and suppliers who will ensure that safety-related information is included in operating, maintenance and training procedures.
- In liaison with SKAO HSE Manager and Officers, supported by the SKAO NEC Project Manager, the Integrating Organisation's HSE manager and the Tier 1 Work Package contractors site HSE officer(s) who shall, variously, review all contract change proposals for impact on health, safety and environmental requirements.
- In liaison with SKAO HSE Manager and Officers, supported by the SKAO NEC Project Manager, the Integrating Organisation's HSE manager and the Tier 1 Work Package contractors site HSE officer(s) shall collect evidence to support a health, safety and environmental management database (HMD) - refer to Appendix 12 for proposed details of HMD.
- In liaison with SKAO HSE Manager and Officers, supported by the SKAO NEC Project Manager, the Integrating Organisation's HSE manager and the Tier 1 Work Package contractors site HSE officer(s) shall provide a Health, safety and environmental management database (HMD)(details under development) to support acceptance into service.
- In liaison with the Director of Operations, the HoHSSE shall review and endorse the final health, safety and environmental management database (HMD).
- An independent auditor may carry out a review of any relevant aspect of HSE if requested by HoHSSE (or if statutory requirement e.g. national legislation).

- Site safety during construction and later Integration & Verification/Engineering Commissioning must be in accordance with the relevant sections of the host country organisation's site safety manual and national safety standards, whichever are the higher,
- Achievement of Safety Certification. The aim must be to have all required certificates in place prior to acceptance of any Works by the SKAO (or their nominated representatives).

The main documents to be used in support of the Procurement Phase will be developed in future iterations of this HSE Plan (refer to Appendix 13).

Further detailed HSE Construction site requirements are provided in sections 14 and 15 of this HSE Plan.

4.4.3 Operations Phase(s) (including 'Handover' Operations)

This phase normally concerns the actual operation of telescopes once they have been assembled, integrated, tested and verified. Groups of telescopes will normally be planned for release to operations in batches or phases. Operations normally refer to engineering or maintenance activities by day and performance or science testing by night.

'Handover' is an activity that typically happens daily and by shift (according to the working routine of the staff) and any particular 'Handover' is an activity that refers to the transfer of responsibility form one group to another as the telescope or array progresses through its various stages of verification and acceptance to 'Final Handover' when the project developer will transfer ownership and responsibility to the final owner / operator.

It is noted that handover is likely to be phased and that this will impose inherent changes to responsibilities and complexities of control which may have safety implications.

Operations in the Host Countries will be part of the SKA Observatory and managed by the GHQ. The managers of Host Country activity will report functionally to the SKA Director-General, within the context of the contractual relations or the overall management structure chosen for the SKA Observatory (as discussed in Section 4.1).

The main documents to be used in support of the Operations Phase will be developed in future iterations of this HSE Plan (refer to Appendix 13).

Further detailed HSE Operations requirements are provided in section 8 of this HSE Plan.

5 Leadership

The success of a safety management system depends on leadership, commitment and participation from all levels and functions of the organisation.

5.1 Leadership and commitment

A strong safety culture is recognised as making a vital contribution to achieving excellent performance, requiring action by the SKAO and every supplier.

The SKAO shall seek appropriate measures on the project including, but not limited to, the encouragement of near miss reporting, the use by suppliers of safety climate and culture tools and other employee satisfaction measures, behavioural safety and environmental management programmes, benchmarking, recognition, incentives and other mechanisms to create, embed and sustain an effective safety culture.

To meet our key safety objectives, we recognise that this will require:

- committed leadership within all suppliers in continually improving safety performance;
- systematic safety management including good communications, consultation and access to guidance;
- formation of integrated project teams to manage safety risks by good design and construction practices;
- adequate resource and commitment to avoid conflicts between safety goals and short-term production issues;
- competent and informed staff appointed at all levels, encouraged to develop through regular appraisal, guidance, training and recognition;
- encouragement for appointed staff to stay working for the project/package until their work is complete;
- quality system arrangements within and between the parties so that self-reported performance data may be trusted as valid and verified; and
- Effective consideration of safety throughout the planned lifecycle.

This applies to the level of detail and effort put into assessing the risks, implementing controls, supervising and monitoring.

5.2 HSE Policies

Senior management shall establish, implement and maintain their HSE policy in consultation with workers at all levels of the organisation.

A Health, Safety and Environmental Policy is a set of commitments to achieve positive HSE outcomes.

SKAO expect their partner or stakeholders (e.g. Tier 1 Work Package contractor / consultant / supplier) to have in place an equivalent formal health and safety policy setting a clear direction for their organisation to follow and should be shared throughout the workforce, so that everyone understands how health and safety will be managed.

The responsibility for establishing, implementing and maintaining an HSE policy rests with an organisation's top management.

Commonly accepted practice is a short statement of key principles, however, the policy could also be presented as a poster, a web page or anything else which meets the organisation's needs and complies with legal or other requirements.

In developing its HSE policy, an organisation should ensure the agreed commitments align with other policies in the organisation and that workers understand the overall commitment of the organisation to HSE.

The policy should be reviewed periodically to ensure that it remains relevant and appropriate to the organisation.

If changes are made, the revised policy should be communicated, as appropriate.

A copy of the SKAO Health, Safety and Environmental Policy [RD1] is attached in Appendix 1 to this Plan.

5.3 Organisational roles, responsibilities and authorities

SKAO senior management will ensure that the responsibilities and authorities for relevant roles within an Integrating Organisation HSE management system are assigned and communicated at all levels within the SKAO and its partner, contractor and supplier organisations and maintained as documented information.

SKAO senior management is ultimately responsible for the Integrating Organisation HSE management system, even if the day-to-day decisions related to occupational health and safety are delegated to others. What is delegated and to whom should be clearly and unambiguously communicated so that everybody understands who is responsible for what.

Senior management (within SKAO and their partner organisations) should assign the responsibility and authority for:

- Ensuring that their HSE management system conforms to the requirements of [RD2] ISO 45001 (or suitable equivalent);
- Reporting on the performance of the HSE management system to top management.

Since resources can be limited, opportunities should be sought out to integrate HSE responsibilities within existing functions of an organisation, such as manufacturing, facilities management, purchasing, and human resources. If other management systems are already in place, such as quality, energy or food safety, synergies may exist where there are similar roles and responsibilities. This will enhance ownership of HSE management across the organisation and potentially create efficiencies.

[RD2] ISO 45001 requires that the responsibilities and authority of all persons who perform duties that are part of the HSE management system be documented. These can be described and included in:

- HSE management system procedures;
- Operational procedures and process maps;
- Project and/or task descriptions;
- Job descriptions;
- Induction training packages.

Such documentation can, among others, be required for the following personnel:

- Management at all levels in the organisation, including top management;
- Safety committees/safety teams;
- Process operators and the general workforce;
- Those managing contractors;
- Those responsible for HSE training;
- Those responsible for equipment operation and maintenance;
- Those responsible for facilities management;
- Employees with HSE qualifications, or other HSE specialists, within the organisation;

Care should be taken with the clarification of responsibilities at the interfaces between different functions (e.g. between departments, between different levels of management, between workers, between the SKAO and contractors and between the SKAO and its neighbours).

5.3.1 SKAO HSE Framework

Acting in a semi-autonomous capacity, on behalf of the Director General, HSE dutyholders will provide suitable and sufficient oversight of all SKAO activities that may have significant health, safety or environmental implications.

This will include, but not be limited to, those areas identified in Figure 2.

These interfaces will evolve as the SKAO transitions from S-CDR to construction/commissioning through to operations/maintenance. Detailed roles and responsibilities for these latter phases will be developed in further revisions of this SKAO HSE Plan (refer Appendix 13).

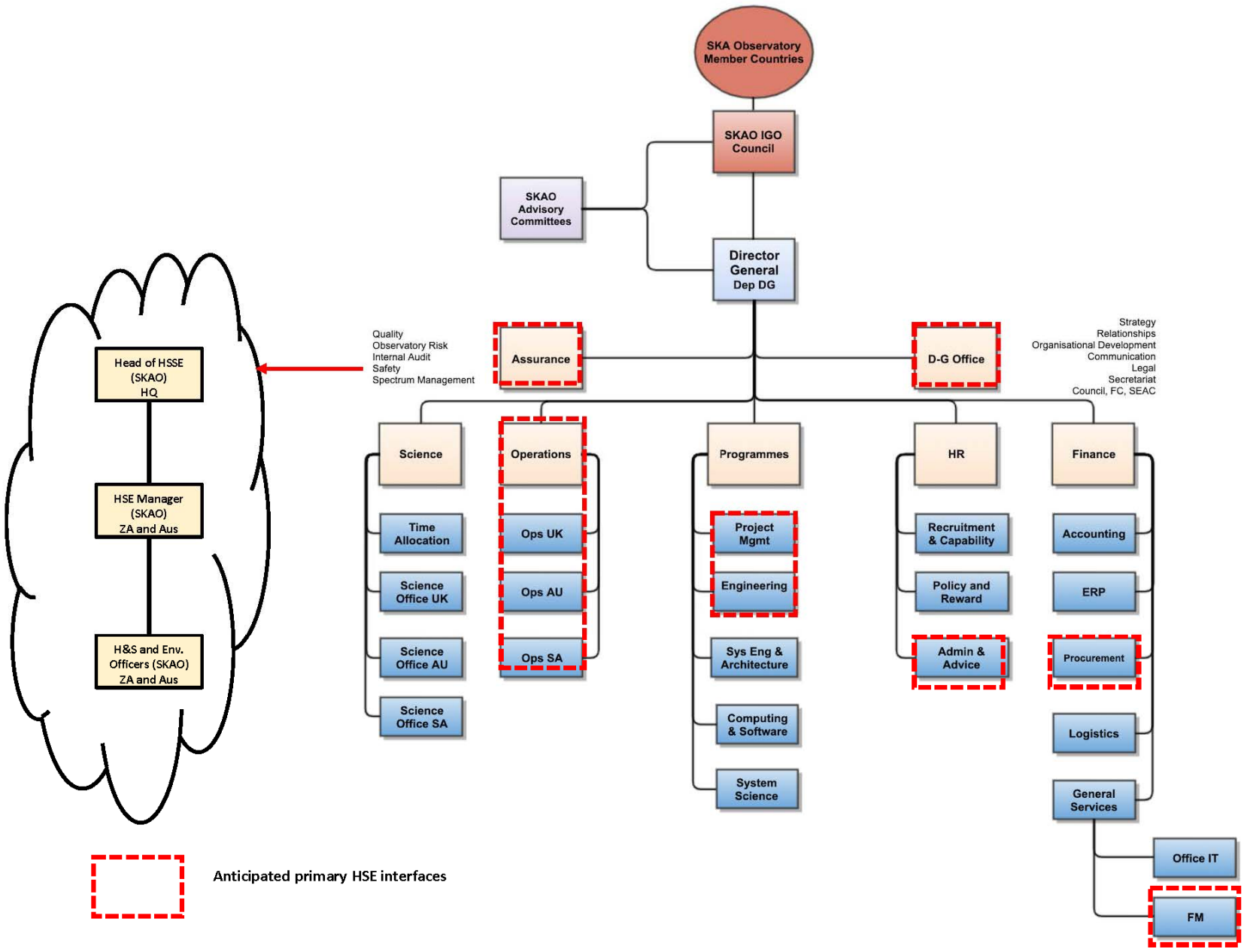


Figure 2: SKAO HSE structure and inter-relationships

5.3.1.1 SKAO Design Deliverables

<u>Core Principles</u>

During the initial design of SKA1 (in particular by the element design consortia) common safety methods were used to analyse and evaluate hazards throughout the design process, providing key deliverables with respect to safety in design.

Safety in design has been actively sought throughout the lifecycle of the project through lessons learned, education and appropriate initiatives.

Implications of changes to design were monitored and mitigation implemented to take changes into account, with appropriate updates made to documentation.

Open communication was available to all project stakeholders to encourage collaboration and ensure that principles are reflected throughout the project.

Effective Safety in Design can result in many benefits, including:

- Better understanding of design requirements and limitations.
- Effective prevention of injury and illness.

- Improved productivity and reduced costs.
- Enhanced forecasting and product planning.
- Innovation through new thinking to resolve hazards.

Safety in Design should impact users throughout the project lifecycle and is designed to control risk to persons involved in:

- Design.
- Engineering Commissioning/Construction.
- Operations and Maintenance.
- Alterations/Repairs.
- Decommissioning/Demolition.

Designers controlling HSE risks

Designers, from concept to detail, are required to identify hazards which may create significant risks for contractors, users and maintenance personnel and seek to reduce them.

Design teams should be aware that the SKAO is determined that they design for HSE during each stage of the project, and that their processes and intermediate outcomes as well as final designs shall be subject to competent external scrutiny.

Designs that do not meet these expectations, and in particular where there are opportunities that have not been seized to improve the embedding of good safety practice and/or eliminate/reduce significant risks, shall not be deemed acceptable and reworking will be required (subject to assessments of reasonable practicability).

Safety Management Framework

[RD8] Safety in Design Compliance Report (SIDCR) SKA-TEL-SKO-0001059 aims to provide an overview of all Safety Management activities undertaken to date for the SKA Project and provide a narrative for the integration of artefacts and the wider system of interest.

The SIDCR is defined through the activities that have taken place during the creation of the Hazard Safety Register (HSR), Safety Action Register (SAR) and Master Data Assumption List (MDAL). Through data raised and reviewed in these documents and following the guidelines set out in the HSE Policy (SKA-GOV-0000063), this HSE Plan is shaped towards the next phases of the project.

Whilst the SIDCR provides a description of the processes used to create the HSR, SAR and MDAL, as the project continues to progress through the next phases, it shall remain as a live document to be updated.
It will primarily be used to provide updates to information held in the HSR and SAR.

The full Safety Management Framework Architecture can be viewed in Appendix A of the SIDCR. This and the contents of the SIDCR explain the interactions between HSE Management artefacts and wider project integration.

Safety Management Dependant Functions

As set out in [RD8] Safety in Design Compliance Report certain project functions will be dependent on the data gathered in the Safety Management Framework to be fully realised in the next phases of the project and will reference the findings raised.

This SKAO HSE Plan directly influences other key artefacts within the Project, including

- [AD1] SKA Project Execution Plan SKA-TEL-SKO-0001100,
- [RD7] SKA1 Operations Plan SKA-TEL-SKO-0001012,
- [RD12] Procurement Policy SKA-TEL-GOV-00000069 and
- Construction Proposal (TBW).

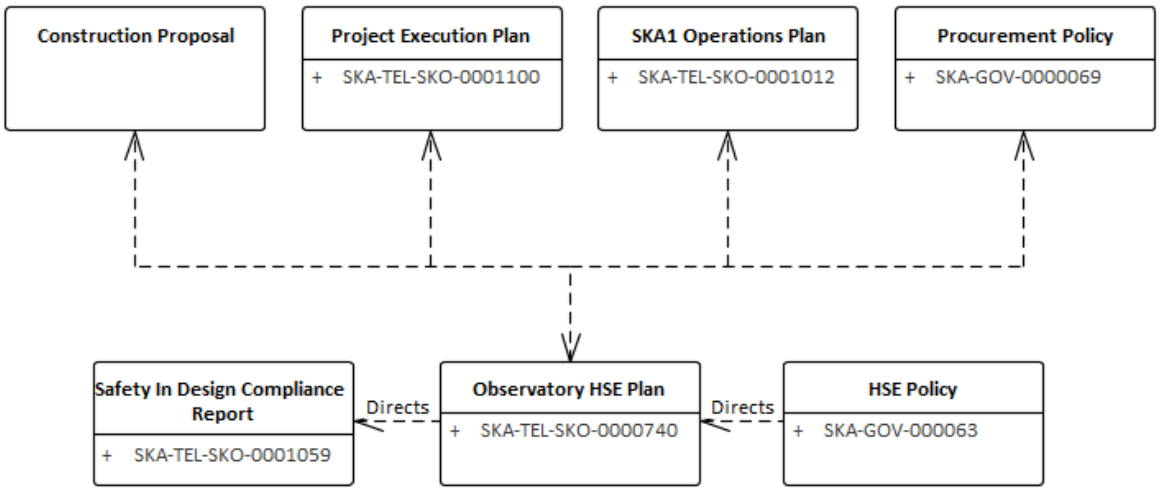


Figure 3: Project HSE Plans and Policies

5.3.1.2 SKAO Construction, Integration and Verification activities

As discussed in [AD1] SKA Project Execution Plan SKA-TEL-SKO-0001100, in the area of infrastructure construction, the complex interplay of jurisdictions and compliance requires significant additional effort to achieve. The model for this is shown in Figure 4 below. In this model the "Client" (SKAO) is represented by the Product Delivery Team, however the individual infrastructure contracts will require a different set of Supervisory disciplines not resident within SKAO (in sufficient capacity) and so an NEC4 PSC will provide that support alongside an NEC4 PSC for Project Management for each separate contract. The Product Delivery Team will manage these PSCs (PSC Project Manager) toward the realisation of the full infrastructure work scope.

With reference to [RD15] MeerKAT Science SKA1 Construction Interferences Management Plan SKA-TEL-SKO-0000975 HSE Management of the site will be undertaken by SARAO (as owner of the site) through a Master Service Level Agreement with the SKAO. At time of writing this HSE Plan discussions are ongoing with CSIRO.

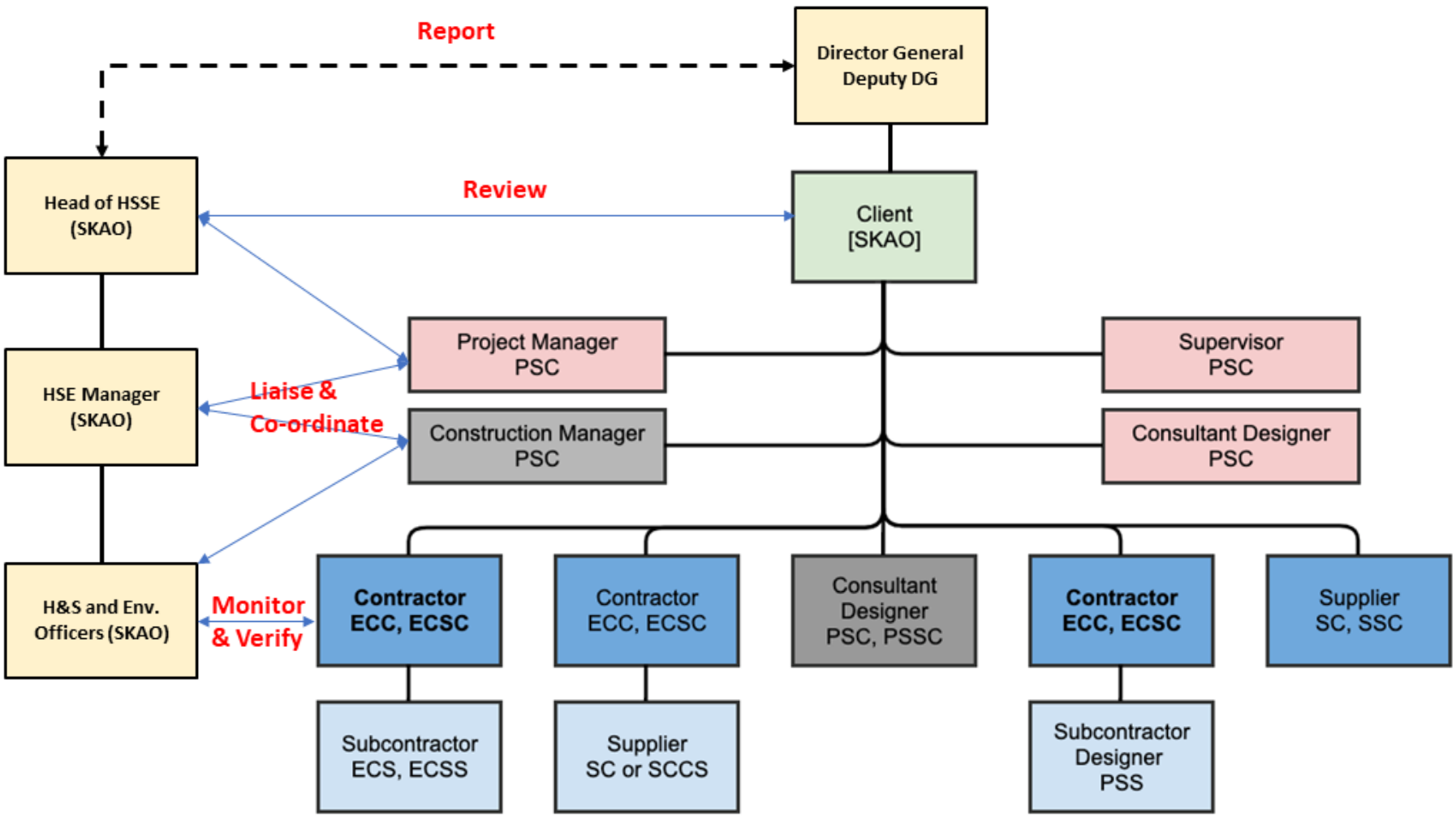


Figure 4: HSE interfaces during SKAO Construction phase

Green roles are fulfilled by SKAO staff. Red roles are fulfilled through NEC4 PSCs and for infrastructure are expected to be CSIRO/SARAO institution staff.
Grey areas are those not relevant to the SKA1 construction having been completed in the Pre-construction design phase.
Blue areas are potential T1 contracts with those bolded being the most common.

5.3.1.3 SKAO Operations

The [RD7] SKA1 Operations Plan (OP) SKA-TEL-SKO-0001012 is the primary document that will describe how the SKA Observatory will operate. It describes the process for its ongoing development and review leading to its submission to the SKA Observatory Council in mid-2020.
The OP is the primary document that will describe how the SKA Observatory will operate. Along with the Construction Proposal and the Development Plan, it will be submitted to the SKA Observatory Council for approval (mid-2020).

The first version of the OP is necessarily incomplete. The major outstanding areas are:
Engineering Operations: This will be substantially revised to take full account of the reliability and logistic support analyses that are currently underway as input to the System CDR. It is envisaged that CSIRO and SARAO will be participants in this work, building towards the operational partnership arrangements,
Observatory Management Structure: This section is currently blank but will be written for future versions when the organisational design and the operational partnerships with the Host Countries become mature,
Staffing and Budget Estimates: current estimates are provided but without explanatory text. In future versions this section will contain a justification of the requested resources.

The OP will continue to be developed for eventual for submission to the Council along with the Construction Proposal.

Section 8 of this HSE Plan provides insight into a planning for a future SKAO Operations HSE management system.

5.3.2 SKA1 HSE Roles and Responsibilities – Construction phase

The following section provides a description of SKA1 key duty holders (with roles and responsibilities currently assumed for HSE management during construction phase).
(Note: This description assumes combined health & safety and environmental (HSE) management systems. Suppliers having separate, but complimentary, H&S and environmental systems are acceptable.)

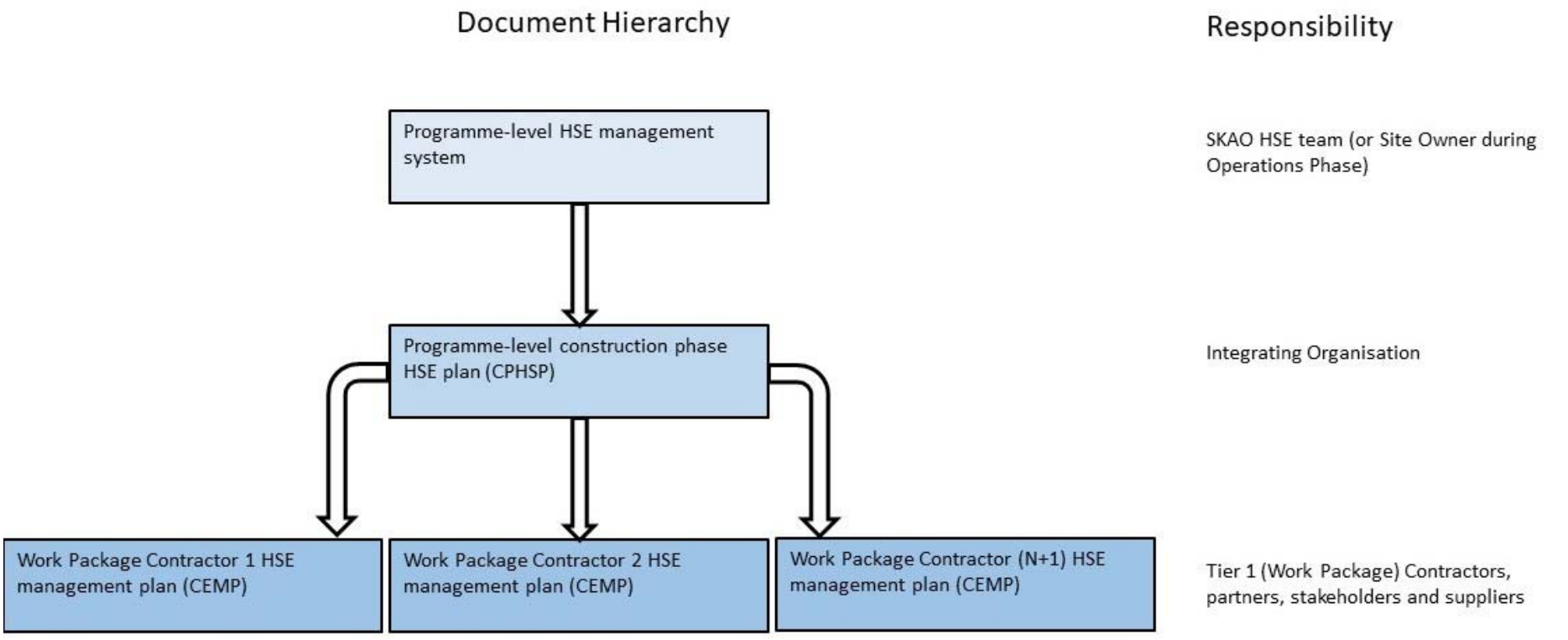


Figure 5: Document hierarchy and responsibilities for HSE management arrangements on SKA1 sites

Anticipated roles and responsibilities for Integration & Verification (Engineering Commissioning) phase of SKA1 are addressed in section 16 of this HSE Plan.

Anticipated roles and responsibilities for the Operations phase of SKA1 are addressed in section 8 of this HSE Plan.

5.3.2.1 SKAO Director-General

At present, in accordance with the [RD1] SKAO Health, Safety and Environmental Policy, the responsibility for all HSE aspects in projects combined to the programme reside with the Director-General and SKAO Board.

In future, the Director General will be responsible to the SKA Observatory Council for effective leadership of the SKA Observatory. He/She will have delegated authority to assume the responsibility of all areas of management in particular for all personnel and safety matters.

The Deputy Director-General ensures the HSE requirements and responsibilities are understood throughout the project, and adequately relayed and distributed within the project organisation.

The Head of Health, Safety, Security and Environmental (HoHSSE) advises the Director General and Deputy Director General.

At time of writing this HSE Plan personnel with specific SKA1 HSE related roles include, but are not limited to:

5.3.2.2 Head of Health, Safety, Security and Environmental (HoHSSE)

The HoHSSE is responsible for leading project safety and environmental management at the SKA sites in Australia and South Africa as well as the SKA Headquarters.

The Head of Health, Safety, Security and Environmental duties include, but are not limited to:

1. Reporting directly to the Director General and Deputy Director General on all significant HSE matters,
2. Establishing a visible HSSE leadership on the project,
3. Developing a pro-active HSSE culture that delivers positive commitment to, and engages all employees in, continuous performance improvement and promotes best practice,
4. Developing, implementing and reviewing the SKA Organisation's policies and procedures for HSSE, including appropriate training and audit programmes,
5. Line Management of SKAO HSE Manager, H&S Officer(s) and Environmental Officers(s),
6. In liaison with SKAO HSE Manager(s) and Officer(s) and any other relevant personnel, reviewing and evaluating the Integrating Organisation and Tier 1 Work Package contractor HSE processes and their implementation,
7. Developing HSSE performance indicators and monitoring across the project,

8. In liaison with SKAO HSE Manager(s) and Officer(s) and any other relevant personnel, organising HSE audits and ensure implementation of recommendations,
9. Ensuring that HSE is considered in the Element designs and in SKA1 construction activities at the SKA host sites in Australia and South Africa,
10. Ensuring that HSE related hazards and risks are effectively managed by those responsible,
11. Leading the development and/or review of HSE related policies, procedures, plans and other HSE related documentation,
12. In liaison with SKAO HSE Manager(s) and Officer(s) and any other relevant personnel, maintaining project hazard/risk/action tracking registers on an on-going basis,
13. Preparing HSE status reports for Director General and SKAO Board as required,
14. Ensuring SKA Organisation's compliance with relevant health, safety and environmental legislation, both in the UK and in the host site countries,
15. Ensuring SKA Organisation's HSE Plan is kept up to date,
16. In liaison with SKAO HSE Manager(s) and Officer(s) and any other relevant personnel, conducting investigations into any workplace accidents and report to the appropriate outside agency, and
17. Managing the process of [RD30] Business Continuity Planning (regarding aspects with health & safety implications) within SKA Organisation.

5.3.2.3 SKA NEC4 Project Manager

Based in either Australia or South Africa, the NEC Project Manager must inform the SKAO HSE Manager and HoHSSE of any significant HSE implications arising from discharge of his/her duties.

This will include, but not be limited to:

1. In liaison with SKAO HSE Officer and Integrating Organisation, reviewing and reporting on Tier 1 Work Package contractor compliance with Core Clause 27.4 of NEC4 Contract,
2. Ensuring provisions for relevant health & safety requirements are included in each Tier 1 Work Package contractor Clause 31 programme submitted for acceptance,
3. In liaison with SKAO HSE Officer, acceptance of any relevant health & safety related RAMS (risk assessments / method statements) arising from each Tier 1 Work Package contractor Clause 31 programme,
4. Early Warning notifications (by any party) and Early Warning Meetings,
5. Assessment, notification and implementation of Compensation Events,
6. Acceptance of Tier 1 Work Package contractors Programmes and/or Clause 31 Method Statements,
7. Final inspection, hand over and certification of completion (or partial completion) certificates,
8. Acceptance of any Tier 1 Work Package contractors designs,
9. Notification of or clarification of ambiguities,
10. Coordination, planning and inputs to HSE related Value Engineering/Value Management studies,
11. Proposed changes to Scope of Works,
12. Ensuring preparation of as-built drawings, Operations and maintenance documentation and contributions to SKAO Health, safety and environmental management database (HMD),
13. Assisting SKAO Safety Manager/Officer(s) in liaising with relevant third parties and statutory authorities,
14. Assisting SKAO Safety Manager/Officer(s) in monitoring Health, Safety and Environmental practice on site,
15. Provision of Technical and Contractual advice,
16. In liaison with SKAO HSE Officer and SKAO HSE Manager, advising SKAO Deputy Director-General and SKAO HoHSSE if Tier 1 Work Package contractor has substantially broken a health or safety regulation and has not rectified in accordance with Core Clause 91.3 of NEC4 Contract.
    (NB: Deputy Director-General *may subsequently require termination of Tier 1 Work Package contractor Contract).*

5.3.2.4 SKAO NEC4 Supervisor

Based in either Australia or South Africa, an SKAO NEC Supervisor is responsible for the following:
Based in either Australia or South Africa, the NEC Project Supervisor must inform the NEC Project Manager and SKAO HSE Manager/Officer(s) of any significant HSE implications arising from discharge of his/her duties.
This will include, but not be limited to:

1. In liaison with SKAO HSE Officer, monitoring Tier 1 Work Package contractor compliance with Core Clause 27.4 of NEC4 Contract,
2. Maintaining surveillance of HSE Plan(s),
3. In liaison with SKAO HSE Officer, monitoring HSE practice on site,
4. In liaison with SKAO HSE, receive accident, incident and near-miss reports as required,
5. Attending any relevant HAZOP, HAZCON and HAZCOMM meetings (as deemed necessary by project delivery stakeholders),
6. In liaison with Integrating Organisation and SKAO HSE Officer, monitoring safe systems of working,
7. In liaison with Integrating Organisation and SKAO HSE Officer, monitoring environmental practices,
8. In liaison with SKAO HSE Officer, monitoring any Tier 1 Work Package contractors HSE self-certification systems,
9. In liaison with SKAO HSE Officer, monitoring Tier 1 Work Package contractor waste disposal strategies,
10. In liaison with SKAO HSE Officer, monitor compliance with HSE related statutory notices, licences and special conditions,
11. Notifying Tier 1 Work Package contractor(s) of HSE non-compliance, defects and/or violations,
12. In liaison with SKAO HSE Officer, advising NEC Project Manager, SKAO HSE Manager and SKAO HoHSSE if Tier 1 Work Package contractor has substantially broken a health or safety regulation and monitor subsequent rectification in accordance with Core Clause 91.3 of NEC4 Contract.

5.3.2.5 SKAO HSE Manager(s)

Based in either Australia or South Africa, an SKAO HSE Manager is responsible for the following:

1. Reporting directly to SKAO Head of Health, Safety, Security and Environmental,
2. Responding to Integrating Organisation, Tier 1 Work Package contractor and Site Owner HSE communications and escalating, where necessary, to SKAO NEC Project Manager and HoHSSE,
3. Reviewing, implementing, and administering all aspects of the SKAO HSE Plan,
4. Evaluating SKAO compliance, develop, present and implement all policies and procedures which ensure that the site is in full compliance with all applicable safety, security, health and environmental regulations,
5. Reviewing implementation of the SKAO HSE Plan, including assessments to ensure that it is valid and current,
6. Directing communication with and motivation of all levels of SKAO management and staff to assure efficient HSE program implementation,
7. Conducting or overseeing all HSE training, and security concepts,
8. Reviewing construction specifications to ensure Tier 1 Work Package contractor compliance with fire, health, safety and environment applicable codes,
9. Coordinating with architects, engineers and SKAO management to review HSE requirements,
10. Conducting site HSE inspections,
11. Developing health, safety and environmental educational programmes,
12. Ensuring that HSE training and accident recordkeeping is maintained by appropriate HSE dutyholders,
13. Participating in environmental team meeting to assure site monitoring,
14. Developing, recommending, and implementing policy on environmental protection,
15. Maintaining/conducting SKAO environmental compliance inspections and audits,
16. Maintaining emergency procedures including evacuation, earthquake, fire, flood and other emergencies,
17. Attending Hazop, Hazcon and Hazcomm meetings,
18. Advising, coordinating with and providing HSE guidance to other members of the SKAO team.

5.3.2.6 SKAO Site Health & Safety Officer(s)

SKAO will have a designated Health & Safety Officer(s) based predominantly on site.

Health & Safety Officers have the authority and responsibility to stop work if, in his/her opinion, a serious threat to or impact on safety may be caused directly from Site activities.

These individuals assist the SKAO HSE Manager and Head of HSSE with the development and implementation of the SKAO HSE Programme. Specifically, the H&S Officer(s) is responsible for the following:

1. Reporting directly to SKAO HSE Manager,
2. Responding to Tier 1 Work Package contractor H&S communications and escalating, where necessary, to SKAO HSE Manager,
3. Will be continuously present on site,
4. Coordinating the efforts with site medical services (including emergency evacuation),
5. Maintaining surveillance of H&S Plan(s),
6. In liaison with NEC Supervisor, monitoring H&S practice on site,
7. In liaison with NEC Supervisor, receiving accident, incident and near-miss reports as required,
8. Assisting the NEC Supervisor with security related efforts,
9. Regularly visiting site facilities and installations and report all deficiencies,
10. Recording all significant visits and site H&S control reports,
11. Administering the H&S policies and procedures and new employee induction training,
12. Attending all relevant site H&S meetings,
13. Assisting in the preparation and review of HSE plans,
14. Controlling the maintenance of site specific H&S requirements,
15. In liaison with Integrating Organisation and/or Site Owner (during Operations Phase), coordinating H&S for visitor access and new employees,
16. If required, representing the SKAO in visits or investigations by government agencies, statutory authorities and insurance agencies,
17. Participating in all relevant H&S training,
18. Reporting to the HSE Manager all specific or critical H&S issues,
19. In liaison with NEC Supervisor, advising the NEC Project Manager, SKAO HSE Manager and SKAO HoHSSE if Tier 1 Work Package contractor has substantially broken a health or safety regulation and monitor subsequent rectification in accordance with Core Clause 91.3 of NEC4 Contract,
20. In liaison with relevant third parties, contributing and developing continuous H&S improvement observations and recommendations.

5.3.2.7 SKAO Site Environmental Officer(s)

SKAO will have a designated Environmental Officer(s) based predominantly on site.

SKA Environmental Officers will be responsible for the implementation and monitoring of Contractor EMPs. The Environmental Officers will be responsible for the environmental issues involved with construction, operation and decommissioning phases of the project.

Environmental Officers have the authority and responsibility to stop work if, in his/her opinion, a serious threat to or impact on the environment may be caused directly from Site activities.

These individuals assist the SKAO HSE Manager and Head of HSSE with the development and implementation of the SKAO HSE Programme. Specifically, the H&S Officer(s) is responsible for the following:

1. Reporting directly to SKAO HSE Manager,
2. Responding to Tier 1 Work Package contractor environmental communications and escalating, where necessary, to SKAO HSE Manager,
3. Will be continuously present on site,
4. Coordinating the efforts with site environmental procedures,
5. Maintaining surveillance of Environmental Management Plan(s),
6. In liaison with NEC Supervisor, monitoring environmental practice on site,
7. In liaison with NEC Supervisor, receiving environmental incident and near-miss reports as required,
8. (South Africa) Completing a daily environmental incident log and complaints record sheet which are available for inspection at any time;
9. (South Africa) Notifying externally appointed Environmental Control Officer (ECO) of any incidents or complaints,
10. (South Africa) Notifying Contractor ECOs of any serious non-compliance issues immediately,
11. Assisting the NEC Supervisor with security related efforts,
12. Regularly visiting site facilities and installations and report all environmental deficiencies,
13. Recording all visits and site environmental control reports,
14. Administering the environmental policies and procedures and new employee induction training,
15. Attending all relevant site environmental meetings,
16. Assisting in the preparation and review of environmental management plans,
17. Controlling the maintenance of site specific environmental requirements,
18. If required, representing the SKAO in visits or investigations by government agencies, statutory authorities and insurance agencies,
19. Participating in all relevant environmental training,
20. Reporting to the HSE Manager all specific or critical environmental issues,
21. In liaison with NEC Supervisor, advising NEC Project Manager, SKAO HSE Manager and SKAO HoHSSE if Tier 1 Work Package contractor has substantially broken an environmental regulation and monitor subsequent rectification,
22. In liaison with relevant third parties, contributing and developing continuous improvement environmental observations and recommendations.

5.3.2.8 Integrating Organisation/Professional Services Provider (consultant)

It is envisaged that a competent Integrating Organisation will be appointed by the SKAO (via an NEC4 Professional Services Contract) to coordinate and, in liaison with relevant SKAO NEC Project Managers, control the construction phase of any phase of the project involving more than one Tier 1 or Tier 2 contractor. Their main HSE duties will be to plan, manage, monitor and coordinate the work of the SKA1 construction phase (as directed by the SKAO). Other duties include making sure suitable site inductions and welfare facilities are provided.

The Integrating Organisation has a central role in managing health and safety during the construction phase. It is achieved mainly by developing a Construction Phase Health, Safety and Environmental Plan (CPHSP) from the pre-construction information identified, collated and provided by the SKAO and their relevant partner stakeholder organisations, and by ensuring that this plan is followed. Refer to Appendix 7 for guidance on production of CPHSP.

As the Integrating Organisation will have a central role in managing HSE risks during the construction phase they must have the skills, knowledge, experience and organisational capability to carry out this work (refer Appendix 2 for competency criteria).

The role of Integrating Organisation involves, but is not limited to:

1. liaison with SKAO Telescope Delivery Team planning, managing, monitoring and coordinating the entire construction phase of the SKA1 project,
2. taking account of the health and safety risks to everyone affected by the work (including members of the public), in planning and managing the measures needed to control them,
3. consulting and engaging with workers about their health, safety and welfare,
4. ensuring suitable welfare facilities are provided from the start and maintained throughout the construction phase,
5. liaison with the SKAO, and any relevant designated stakeholders, to share any information relevant to the planning, management, monitoring and coordination of the pre-construction phase,
6. liaise with the SKAO, and any relevant designated stakeholders, for the duration of the project to ensure that all reasonably foreseeable hazards and risks are identified effectively managed,
7. ensuring anyone they appoint has the necessary skills, knowledge, and experience and, where they are an organisation, the organisational capability to carry out the work in a way that secures health, safety and the environment,
8. coordinating the work of contractors,
9. ensuring that the contractors under their control cooperate with each other,
10. ensuring all workers and, where relevant, visitors, have site-specific inductions, and any further information and training they need,
11. ensuring reasonable steps are taken to prevent unauthorised access,
12. before the construction site is set up, preparing, reviewing and revising a construction phase HSE plan for the project setting out health, safety and environmental arrangements and site rules,
13. submit said construction phase HSE plan to SKAO HSE Manager and HoHSSE for formal acceptance prior to any site activities being permitted,
14. ensuring that the construction phase HSE plan is appropriately reviewed, updated, revised and remains fit for purpose during the construction phase,

15. providing the HoHSSE with any information in the Integrating Organisation's possession relevant to their collation of the projects health, safety & environmental management database (HMD) (refer Appendix 12),
16. if the Integrating Organisation's appointment finishes before the end of the project, the HMD must be passed to the next appointed Integrating Organisation for the remainder of the project. That Integrating Organisation must then take on the responsibility for reviewing, updating and revising it and passing it to the SKAO when the project finishes.

Attention is explicitly drawn to the following parts of this HSE Plan which provide further guidance on what is expected of an Integrating Organisation:

- Section 14 - Construction Site Risk Management of HSE
- Section 15 - Construction Site Management of HSE
- Appendix 2 - Core criteria for demonstration of competence
- Appendix 3 - Health, Safety and Environmental aims and indicators
- Appendix 5 - Management of construction phase health & safety hazards and risks
- Appendix 6 - Management of construction phase environmental hazards and risks
- Appendix 7 - Construction phase health & safety plan
- Appendix 8 - Construction phase environmental management plan
- Appendix 9 - Construction site work methods
- Appendix 10 - Construction site – plant and equipment
- Appendix 11 - Alcohol and drugs policy
- Appendix 12 - Health, safety and environmental database

5.3.2.9 Contractors

Attention is drawn to the following reference documents:
[RD16] South Africa - Site Information and Instructions SKA-TEL-SKO-0001040
[RD23] Australia - Site Information Document and Instructions to Contractors (TBW)

It is envisaged that several Tier 1 Work Package Contractors will be appointed by the SKAO, via nominated NEC4 contractor appointments or in-kind appointments, working under the authority of an Integrating Organisation and their associated construction phase HSE plan (CPHSP).

Tier 1 Work Package Contractors are those actually doing the construction (or other related) SKA1 work and are most at risk of injury and ill health. Anyone who directly employs, engages SKA1 workers or controls or manages SKA1 work is deemed a contractor for the purposes of this HSE Plan. This includes companies or organisations that use their own workforce to do SKA1 work on their own premises.

The duties on contractors apply whether the workers are employees or self-employed and to agency workers without distinction.

Anyone who directly employs or engages construction workers or manages construction is a contractor. An individual, a sole trader, a self-employed worker, or a business that carries out, manages or controls construction work as part of their business can be a contractor. This also includes companies that use their own workforce to do construction work on their own premises. The duties on contractors apply whether the workers under their control are employees, self-employed or agency workers.

Where contractors are involved in design work, including for temporary works, they also have duties as designers.

Contractors and the workers under their control are those most at risk of injury and ill-health. They can influence the way in which work is carried out to secure their own health and safety and that of others affected. They have an important role in planning, managing and monitoring the work (in liaison with the Integrating Organisation, where appropriate) to ensure risks are properly controlled. The key to this is the proper coordination of the work, underpinned by good communication and cooperation with others involved.

Contractors have a number of specific duties depending on national statutory Regulations pertaining to the location where they are working. These include the requirements:

- on anyone appointing a designer or contractor (such as the contractor appointing a sub-contractor) to ensure the designer or contractor has the skills, knowledge and experience and, where relevant, organisational capability to carry out the work for which they are being appointed; and
- to cooperate with other duty holders.

Contractors must not carry out any construction work on a project unless they are satisfied that the Integrating Organisation is aware of the duties the SKAO have indicated in this HSE Plan. Contractors should make sure they have a sufficient knowledge of SKAO and Integrating Organisation duties, roles and responsibilities as they affect the project so they can give proper advice. The level of advice will depend on the knowledge and experience of the SKAO and the complexities of the work package delivery.

5.3.2.9.1 Planning, managing and monitoring SKA1 construction work

General

Contractors are required to plan, manage and monitor the construction work under their control so that it is carried out in a way that controls the risks to health, safety and the environment.

The effort devoted to planning, managing and monitoring should be proportionate to the size and complexity of the project and the nature of risks involved.

On projects involving more than one contractor, this will involve the contractor co-ordinating the planning, management and monitoring of their own work with that of the Integrating Organisation and other contractors, and where appropriate the SKAO. Such coordination could involve regular progress meetings with other duty holders to ensure that the contractor's arrangements for planning, managing and monitoring their own work can feed into, and remain consistent with, the wider SKA1 project arrangements. For single contractor projects, the arrangements to plan, manage and monitor the construction phase will normally be simpler.

Planning

In planning the work, the contractor must take into account the risks to those who may be affected e.g. members of the public and those carrying out the construction work. Planning should cover the same considerations as those for the principal, including considering the risks and ensuring the measures needed to protect those affected are in place.
On projects involving more than one contractor, each contractor must plan their own work so that it is consistent with the wider SKA1 project arrangements. Contractors should expect help from other duty holders, for example the SKAO who will have provided pre-construction information.
On single contractor projects, the contractor is responsible for planning the construction phase and for drawing up the construction phase plan before setting up the construction site. The SKAO will have provided any relevant pre-construction information they possess and the time and other resources to help the contractor do this.

Managing

The arrangements for managing construction work must take into account the same issues that the Integrating Organisation must consider.

Monitoring

The contractor should monitor their work to ensure that the health and safety precautions are appropriate, remain in place and are followed in practice. Effective monitoring by the contractor must address the same issues that the Integrating Organisation must consider. This includes using a mix of measures to check performance and taking prompt action when issues arise.
On projects involving more than one contractor, as part of the duty to cooperate with other duty holders, the contractor should provide the Integrating Organisation with any relevant information that stems from their own monitoring so that the Integrating Organisation can monitor the management of health and safety at a wider SKA1 project level.

5.3.2.9.2 Complying with directions and construction phase plan

For projects involving more than one contractor, the contractor is required to comply with any directions to secure health and safety given to them by the Integrating Organisation. They are also required to comply with the parts of the construction phase HSE plan that are relevant to their work, including any relevant site rules (refer to Appendix 7 and 8 for further guidance on the construction phase H&S and Environmental Plans).

5.3.2.9.3 Drawing up a construction phase plan

For single contractor projects, the contractor must ensure a construction phase plan is drawn up as soon as practicable before the construction site is set up. Guidance on contractors' duties in relation to the construction phase plan is set out in Appendix 7 of this HSE Plan.

5.3.2.9.4 Appointing and employing workers

Appointing workers
When a contractor employs or appoints an individual to work on a construction site, they should make enquiries that the individual:

a. has the necessary skills, knowledge, training and experience to carry out the work they will be employed to do in a way that secures health and safety for anyone working on the site; or
b. are in the process of obtaining them.

Reliance should not be placed on an industry certification card or similar being presented to them as evidence that a worker has the necessary qualities. Nationally recognised qualifications (such as NVQs and SVQs) will provide contractors with assurance that the holder has the necessary skills, knowledge, training and experience to carry out a task in such a way. Contractors should recognise that training on its own is not enough. Newly trained individuals need to be supervised and given the opportunity to gain positive experience of working in a range of conditions.
When appointing individuals who may be skilled but who do not have any formal qualifications, contractors may need to assess them in the working environment.

Training workers

To establish whether training is necessary for any worker, a contractor should:

a. assess the existing health and safety skills, knowledge, training and experience of their workers;
b. compare these existing attributes with the range of skills, knowledge, training and experience they will need for the job; and
c. Identify any shortfall between (a) and (b) above.

The difference between the two will be the 'necessary training'. As a general rule, if the person being assessed demonstrates the required qualities then no further training should be necessary. This assessment should take account of the training required by other health and safety legislation.

Assessing training needs should be an on-going process throughout the duration of the project. Further training may be required if:

a. the risks to which people are exposed alter due to a change in their working tasks;
b. new technology or equipment is introduced; or
c. the system of work changes.

Skills can also decline if they are not used regularly. Particular attention should be paid to people who deputise for others on an occasional basis - they may need more frequent further training, than those who do the work regularly.

Contractors should also consider 'softer skills' such as the ability to foresee risk, maintain sensitivity to risk, anticipate mistakes others might make and to communicate clearly, as well as the more technical skills workers require for their work.

Providing supervision

A contractor who employs workers or manages workers under their control must ensure that appropriate supervision is provided.

The level of supervision provided will depend on the risks to health and safety involved, and the skills, knowledge, training and experience of the workers concerned.

Workers will require closer supervision if they are young, inexperienced, or starting a new work activity. In these circumstances, arrangements should be put in place for supervision to continue even when the supervisor is not present. Other factors that should be considered when assessing the level of supervision needed include the level of individuals' safety awareness, education, physical agility, literacy and attitude. Even experienced workers may need an appropriate level of supervision if they do not have some or all of the skills, knowledge, training and experience required for the job and the risks involved.

Supervisors are a vital part of effective management arrangements. Effective supervisors are those who have the skills, knowledge, training, experience and leadership qualities to suit the job in hand. Good communication and people management skills on site are important qualities for supervisors. Where site workers are promoted to a supervisory role, they should be provided with nationally recognised site supervisor training which includes components covering leadership and communication skills.

The role of the supervisor may include team leading, briefing and carrying out toolbox talks. It may also include coaching and encouragement of individual workers and supporting other formal and informal means of engaging with workers. The supervisor has a particularly important part to play as a front-line decision maker in emergencies or when workers on-site face immediate risks that may require work to stop.

Providing information and instructions

Contractors should provide their employees and workers under their control, the information and instructions they need to carry out their work without risk to health, safety or environment. This must include:

a. suitable site induction where this has not been provided by the Integrating Organisation. In such cases, the guidance such as that found in Section 15.3 of this HSE Plan is relevant to contractors;
b. the procedures to be followed in the event of serious and imminent danger to health and safety. These should make clear that any worker exposed to any such danger should stop work immediately, report it to the contractor and go to a place of safety. The procedures should:
    - include details of the person to whom such instances should be reported and who has the authority to take whatever prompt action is needed;
    - take account of the relevant requirements which set out provisions relating to emergency procedures, emergency routes and exits and fire detection and fire-fighting.
c. information on the hazards present on the site that are relevant to their work (e.g. site traffic), the risks associated with those hazards and the control measures put in place (e.g. the arrangements for managing site traffic)

5.3.2.9.5 Preventing unauthorised access to the site

A contractor must not begin work on a construction site unless reasonable steps have been taken to prevent unauthorised access to the site. On projects involving more than one contractor, carrying out this duty must involve the contractors liaising with the Integrating Organisation who is required to ensure reasonable steps are taken in this respect. This can be done via a phone call before the contractor starts work on site or at an early meeting.

For projects involving only one contractor, the contractor must do whatever is proportionate to prevent unauthorised access before starting work on the site. In these circumstances, the guidance provided for Integrating Organisations is also relevant for contractors.

5.3.2.9.6 Providing welfare facilities

Contractors are required to provide welfare facilities which meet the minimum requirements set out in national legislation. This duty only extends to the provision of welfare facilities for the contractor's own employees who are working on a construction site or anyone else working under their control. The duty is as far as is reasonably practicable, so contractors should do whatever is proportionate in providing the welfare facilities set out in national legislation. On projects involving more than one contractor, meeting this duty will involve discussing and

agreeing with the Integrating Organisation who has a similar duty to provide welfare facilities. For projects involving only one contractor, the contractor themselves must ensure that suitable welfare facilities are available.

5.3.2.10 Site Owner

It is anticipated a "Site Owner" will be appointed during SKAO Operations phase.

As stated in [RD7] SKA1 Operations Plan (OP) SKA-TEL-SKO-0001012 it is envisaged that CSIRO and SARAO will be participants in a future operational partnership arrangements.

Specific HSE duties and responsibilities will be reviewed and detailed in future revisions of this HSE Plan (ref Appendix 13).

5.4 Consultation and participation of workers

The SKAO is committed to encouraging positive engagement with the workforce on all aspects of health, safety and environment. It recognises that in addition to meeting legal obligations, effective consultation and engagement is a fundamental mechanism for achieving high standards of health and safety throughout the programme.

The SKAO recognises that the primary focus for HSE management, and thus also for the engagement of the workforce, is at project level. It is here that each work package Contractor and their supply chain of sub-contractors is required to establish appropriate arrangements for consultation with the project workforce, directly and/or through appointed representatives.

The SKAO requires each Contractor to make appropriate arrangements for such worker engagement. Where formal meetings are held, such as those of formally constituted health and safety committees, the Integrating Organisation is required to forward the minutes to the SKAO HSE Manager (with copy to SKAO NEC project manager) so that matters raised may be reviewed, and issues that are relevant beyond the project itself may be identified and addressed.

The SKAO understands that through effective consultation within the project, the Integrating Organisation and supply chain is in the best position to take appropriate action as a result of matters raised.

The SKAO shall seek to support consultation and engagement activities within projects, by developing site-wide communications arrangements, so that discussions and decisions are informed with accurate information. The SKAO communication strategy will also address matters such as leadership, motivation and behaviour to encourage engagement within each project.

6 Planning

An effective system for HSE management requires organisations to plan to control risks; to react to changing demands and to sustain positive HSE attitudes and behaviours.

6.1 Actions to address risks and opportunities

6.1.1 General

Planning is an integral part of all elements of any HSE management system. Effective planning is concerned with prevention by identifying, eliminating and controlling hazards and risks. This is particularly important when dealing with health risks, which might only become apparent after a long gestation period.

Planning is a collaborative effort involving personnel throughout the SKAO project. This co-operation is eminently suitable for demonstrating and gaining commitment to continual improvement and promoting a positive health and safety culture throughout the SKAO and our partners, stakeholders or suppliers.

Planning the Integrating Organisation HSE management system is an ongoing process and is undertaken in order:

- To determine the risks that can affect the HSE performance of the organisation;
- To manage these risks;
- To identify opportunities to improve HSE performance and the Integrating Organisation HSE management system.

When planning for their HSE management system, partner, stakeholder and supplier organisations should take into account the following:

- The SKAO and its context (section 4.1);
- The needs and expectations of workers and other interested parties (section 4.2);
- The scope of the Integrating Organisation HSE management system (section 4.3).

Planning should be proportionate to the level of risk identified.

While an organisation should consider all potential risks to its HSE performance it should focus on those hazards which are most likely to occur and/or have the greatest impact.

Companies should concentrate on those opportunities that can realistically be acted upon, with priority given to those that are most likely to improve performance.

Examples of opportunities to improve HSE performance include the following:

- Identification of hazards, how they are communicated, analysed and controlled;
- Use of “Plain English” (or local equivalent) to effectively communicate significant or unusual HSE hazards and risk;
- Enhancing the inspection and auditing functions;
- Introduction of job safety analysis and task-related assessments;
- Modification of working processes including the alleviation of monotonous and repetitive work;
- Implementation of permit-to-work processes;
- Incident or nonconformity investigations and corrective actions;
- Implementation of ergonomic and other injury prevention-related assessments;
- Integration of occupational health and safety considerations at the earliest stage in the design life cycle of plant and equipment;
- Integration of occupational health and safety considerations at the earliest stage in planning for facilities relocation, and/or process redesign;
- Introduction of new technology;
- Improvement of the occupational health and safety culture of the organisation;
- Enhancing the visibility of top management’s support for the Integrating Organisation HSE management system;
- Enhancing the incident investigation process;
- Improving worker consultation and participation;
- Benchmarking of the organisation’s HSE performance against that of other organisations;
- Collaborating in forums that review issues relating to occupational health and safety.

Partner, stakeholder and supplier organisations must maintain documented information on:

- Risks and opportunities;
- The process and actions needed to determine and address its risks and opportunities to the extent necessary to have confidence that they are carried out as planned.

6.1.2 Hazard identification and assessment of risks and opportunities

Paperwork which adds little to the management of risk is a waste of effort and can be a dangerous distraction from the real business of risk reduction and safety management.

6.1.2.1 Hazard identification

The overall purpose of the risk assessment process is to evaluate the hazards that arise or might arise in the course of the organisation’s activities, and ensure that the risks to people arising from these hazards are assessed, prioritized and controlled to eliminate hazards or reduce risks to acceptable levels.

Hazards have the potential to cause injury or ill health. They need to be identified before the risks associated with these hazards can be assessed and, if no controls exist or existing controls are inadequate, effective controls should be implemented according to the hierarchy of controls.

Hazard identification should aim to determine proactively all sources, situations or acts (or a combination of these), arising from an organisation’s activities, with a potential for harm in terms of injury or ill health. Examples include:

- Sources (e.g. moving machinery, radiation or energy sources);
- Situations (e.g. working in confined spaces, working at height);
- Acts (e.g. manual handling, wearing PPE).

Hazard identification should consider the different types of hazards in the workplace, including:

- Physical (e.g. slips, trips and falls, entanglement, noise, vibration, harmful energy sources);
- Chemical (e.g. inhalation, contact with or ingestion of chemicals);
- Biological (e.g. contact with allergens or pathogens such as bacteria or viruses);
- Psychosocial (e.g. threat of physical violence, bullying or intimidation);

Partners, stakeholder and suppliers hazard identification process should take account of the following:

- Routine and non-routine activities such as plant cleaning and maintenance, extreme weather conditions, refurbishment and plant start-ups/shut-downs;

- Activities of all persons having access to the workplace including contractors, visitors and home-based workers;
- Human behaviour, capabilities and other human factors;
- Identified hazards originating outside the workplace capable of adversely affecting the health and safety of person under the control of the organisation within the workplace;
- Hazards created in the vicinity of the workplace by work-related activities under the control of the organisation;
- Infrastructure, equipment and materials at the workplace, whether provided by the organisation or others;
- Changes or proposed changes in the organisation or its activities;
- Modifications to the Integrating Organisation HSE management system, including temporary changes, and their impact on operations, processes and activities;
- Any applicable legal obligations relating to risk assessment and the implementation of necessary controls;
- The design of work areas, processes, installations, machinery/equipment, operating procedures and work organisation, including their adaptation to human capabilities;
- Potential emergency situations;
- Changes in knowledge of, and information about, hazards;
- New or changed hazards.

6.1.2.2 Assessment of HSE risks and other risks to the HSE system

Partners, stakeholders and supplier organisations must establish, implement and maintain a process to:

- Assess HSE risks from the identified hazards, whilst taking into account the effectiveness of existing controls;
- Determine and assess the other risks related to the establishment, implementation and maintenance of the Integrating Organisation HSE management system.

These organisations need to apply the process of hazard identification and risk assessment to determine the controls that are necessary to reduce the risks of injury and/or ill health. The purpose of risk assessment is to address the hazards that might arise in the course of the organisation's activities and ensure that the risks to people arising from these hazards are assessed, prioritized and controlled.

This is achieved by:

- Developing a methodology for hazard identification and risk assessment;
- Identifying hazards;
- Estimating the associated risk levels, taking into account the adequacy of existing controls, based on an assessment of the likelihood of the occurrence of a hazardous event or exposure and the severity of injury or ill health that can be caused by the event or exposure;
- Determining whether these risks are acceptable vis a vis the organisation's legal obligations and its HSE objectives;
- Determining the appropriate risk controls, where these are found to be necessary;
- Documenting the results of the risk assessment;
- Reviewing the hazard identification and risk assessment process on an ongoing basis.

The outputs from the risk assessment process should be used in the implementation and development of other parts of the overall Integrating Organisation HSE management system such as competence, operational planning and control, and monitoring, measurement, analysis and performance evaluation.

There is no single methodology for hazard identification and risk assessment that is suitable for all organisations.

Hazard identification and risk assessment methodologies vary greatly across industries, ranging from simple assessments to complex numerical methods with extensive documentation. Individual hazards might require that different methods be used, e.g. an assessment of long term exposure to hazardous substances might need a different method from that taken for equipment safety or for assessing an office workstation. Each partners, stakeholders and supplier organisation should choose the method that is appropriate to its scope, nature and size. The chosen approach should result in a comprehensive methodology for the ongoing evaluation of the organisation's risks and activities.

Where the organisation's risk assessment uses descriptive categories for assessing severity or likelihood of harm, these should be clearly defined, e.g. clear definitions of terms such as "likely" and "unlikely" are needed to ensure that different individuals interpret them consistently.

Partner, stakeholder and supplier organisations should consider risks to sensitive populations (e.g. pregnant employees) and vulnerable groups (e.g. young workers) as well as any particular susceptibilities of the individuals involved in performing particular tasks (e.g. the ability of an individual to read instructions).

The risk assessment should involve consultation with, and participation by, workers and take into account legal and other requirements.

Risk assessment should be conducted by personnel with competence in risk assessment methodologies and techniques and appropriate knowledge of the organisation's work activities.

The organisations should also consider risks which are not directly related to the health and safety of people, but which affect the Integrating Organisation HSE management system itself and can have an impact on its intended outcomes.

Risks to the Integrating Organisation HSE management system include:

- Failure to understand the context of the organisation;

- Failure to address the needs and expectations of relevant interested parties;
- Inadequate consultation and participation of workers;
- Inadequate planning or allocation of resources;
- An ineffectual audit programme;
- An incomplete management review;
- Poor succession planning for key roles;
- Poor engagement by top management.

6.1.2.3 Assessment of HSE opportunities and other opportunities to the Integrating Organisation HSE management system

Partners, stakeholder and supplier organisation must establish, implement and maintain a process to assess:

- HSE opportunities to enhance HSE performance, while considering planned changes to the organisation, its policies, processes or activities;
- Other opportunities for improving the Integrating Organisation HSE management system.

Opportunities to improve HSE performance can include:

- Consideration of hazards and risks when planning and designing facilities, processes, plant and equipment, and materials;
- Modification of working processes including the alleviation of monotonous and repetitive work;
- Introduction of new technology to ameliorate high-risk activities;
- Collaborating in forums that focus on issues relating to occupational health and safety.
- Introduction of job safety analysis and task-related assessments;
- Implementation of permit-to-work processes;
- Implementation of ergonomic and other injury prevention-related assessments;
- Improvement of the occupational health and safety culture of the organisation;

Opportunities to improve the Integrating Organisation HSE management system include:

- Enhancing the visibility of top management's support for the Integrating Organisation HSE management system;
- Improving worker consultation and participation in HSE decision making;
- Enhancing the incident investigation process;
- Improving two-way communication on HSE issues and promoting HSE in the workplace;
- Expediting corrective actions to address HSE nonconformities;
- Implementing HSE objectives with the same passion as other business objectives;
- Improving competency in identifying hazards, dealing with HSE risks and implementing appropriate controls;
- Adopting a risk assessment approach to conducting HSE audits;
- Viewing workers at all levels as a key resource of the organisation;
- Ensuring that the management review promotes a strategic and critical evaluation of the Integrating Organisation HSE management system

6.1.3 Determination of legal requirements and other requirements

Partners, stakeholder and supplier organisations should have a process to determine and have access to health and safety legal requirements and other requirements applicable to its HSE management, and to determine how these requirements apply to the Integrating Organisation HSE management system.

The process should cover:

- What are the organisation's legal and other requirements and how are they determined, accessed and kept up-to-date;
- How do these legal and other requirements apply to the organisation's activities, processes, plant & equipment, workforce, hazard profile & associated HSE risks, the overall management system and its HSE performance;
- How these legal and other requirements are taken into account when establishing, implementing, maintaining and continually improving the organisation's HSE management system.

Legal requirements could include:

- Relevant Acts and statutory instruments (such as the Australian Work Health and Safety Act, South African Occupational Health and Safety Act or UK Health and Safety at Work Act);
- Licences, permits and other forms of authorisation;
- Improvement or prohibition notices issued by national (or regional) bodies responsible for the regulation and enforcement of workplace health, safety and environmental;

Other requirements could include:

- Parent company protocols or policies;
- Collective bargaining agreements;
- Voluntary adherence to sector or trade body guidance documents;
- Contractual conditions;
- Employment agreements;

- Voluntary principles, codes of practice, technical specifications, charters;
- Public commitments of the organisation or its parent company.

Partners, stakeholder and supplier organisations must ensure that relevant workers know how to access information on legal and other requirements that are applicable to them.
These organisations are required to maintain and retain documented information on this process. This will ensure that the information is updated to reflect any changes to the organisation's health and safety profile.

6.1.4 Planning action

Partner, stakeholder and supplier organisations should ensure that specific plans are in place to:

- Address risks and opportunities that have been assessed as requiring further action;
- Address legal and other requirements;
- Prepare for and respond to emergency situations.

The actions planned should primarily be managed through the Integrating Organisation HSE management system and where appropriate, should involve integration with other business processes and/or management systems such as quality, environment, business continuity, risk management and financial or human resource management.

When planning to take action the partner, stakeholder and supplier organisations should take into account the hierarchy of controls common to risk management, which are detailed in section 8.1.2 of this HSE Plan and outputs from the Integrating Organisation HSE management system.

The actions planned can include establishing objectives (reference section 6.2 of this standard) or incorporating the action into other HSE processes such as documented procedures or improved competence.

Actions to address risks and opportunities should also be considered under section 8.1.3: management of change to ensure that there are no unintended consequences arising from the actions taken.

Finally, partner, stakeholder and supplier organisations need to evaluate the effectiveness of these actions.

6.2 HSE objectives and planning to achieve them

6.2.1 HSE objectives

Partner, stakeholder and supplier organisations should establish objectives in order to maintain and improve the Integrating Organisation HSE management system and to achieve continual improvement in its HSE performance.

When determining its HSE objectives the organisation must take into account:

- The results of the assessments of risk and opportunities;
- Applicable legal and other requirements;
- The results of consultation with workers and where applicable, their representatives.

HSE objectives can be integrated with other business objectives such as quality or environment and should be set at relevant functions and levels as defined and decided upon by the organisation.

The HSE objectives should address both broad corporate HSE issues and HSE issues that are specific to individual functions and levels within the organisation.

Because the term "maintain and improve its HSE management system" is used in this clause, the organisation can set some objectives in order to maintain a certain level of performance and can set other objectives for the purpose of achieving an improvement in its HSE performance. This means that in the case of the former, once a level of performance has been achieved and no further opportunity for improvement can be identified, the organisation can set an objective that maintains that set level of performance until such time as new opportunities are identified.

The HSE objectives should be consistent with the HSE policy and if practicable, be measurable or capable of performance evaluation. Ideally, the objectives should be specific, measurable, achievable, realistic and time-oriented (SMART).

Typical examples of HSE objectives include the following:

- Objectives to increase or reduce a numerical value such as reducing manual handling incidents by 10% or increasing VDU risk assessments by 20%;
- Objectives to introduce controls or eliminate hazards such as the introduction of LEV in a particular process or elimination of a particular hazardous substance from a process;
- Objectives to introduce less hazardous materials in specific products;
- Objectives to increase levels of worker satisfaction in relation to HSE such as a reduction of workplace stress or an increase in worker participation in and consultation on HSE issues;

- Objectives to increase awareness or competence in performing work tasks safety;
- Objectives to meet legal requirements prior to their enactment.

The objectives should be monitored, communicated and be updated as appropriate.

The organisation is not required to establish HSE objectives for every risk and opportunity it determines.

6.2.2 Planning actions to achieve HSE objectives

In order to achieve the objectives a programme or programmes should be established.

A programme is an action plan for achieving one or all of the HSE objectives.

The programme, at a minimum, should address the following:

- What is to be done;
- What resources (e.g. financial, human, equipment & infrastructure) will be required;
- Who will be responsible;
- When it will be completed;
- How the results will be evaluated, including indicators for monitoring.

The programme should be reviewed at planned intervals, and adjusted as necessary, to ensure that the objectives are achieved. This review can be part of the management review process.

The organisation must maintain and retain documented information on the HSE objectives and plans to achieve them.

7 Support

This section provides guidance on the support required to ensure that the Integrating Organisation HSE management system can function effectively.

This section encompasses the following:

- Competence;
- Awareness;
- Communication;
- Documented information

7.1 Resources

Partner, stakeholder and supplier organisations must initially determine and provide the resources necessary to establish, implement, maintain and continually improve its HSE management system.

The identification, procurement and provision of resources are the prerogative of senior management and their absence or diminution can be a limitation on the effectiveness of their HSE management systems.

Examples of resources include:

- Human;
- Natural;
- Infrastructure;
- Technology.

Examples of infrastructure include an organisation's:

- Buildings;
- Plant;
- Equipment;
- Utilities;
- Information technology;
- Communications systems;
- Emergency containment systems.

Resources should be provided in a timely and efficient manner.

Resource allocations should consider the organisation's current and future needs.

7.2 Competence

All designers, contractors and other team members that organisations propose to engage are must be competent (or work under the supervision of a competent person), adequately resourced and appointed early enough for the work they have to do.

This section gives advice about assessing the competence of organisations and individuals engaged or appointed. These will include (but not be limited to) design co-ordinators; designers; SKAO Integrating Organisation, Tier 1 Work Package Contractors (including, without exception, "in-kind" appointees) and sub-contractors.

Assessment should focus on the needs of the particular activities and be proportionate to the risks, size and complexity of the work.

To be competent, an organisation or individual must have:

(a) sufficient knowledge of the specific tasks to be undertaken and the risks which the work will entail;

(b) sufficient experience and ability to carry out their duties in relation to the project; to recognise their limitations and take appropriate action in order to prevent harm to those carrying out construction work, or those affected by the work.

Organisations and individuals will need specific knowledge about the tasks they will be expected to perform, and the risks associated with these tasks. This will usually come from formal or 'on the job' training.

Appropriate experience is also a vital ingredient of competence. People are more likely to adopt safe working practices if they understand the reasons why they are necessary, and past experience should be a good indicator of the person's/company's track record.

The development of competence is an ongoing process. Individuals will develop their competence through experience in the job and through training which is part of 'life-long learning'.

Professionals such as designers, design co-ordinators and advisors should be signed up to a 'Continuing Professional Development' programme either through their company or professional institution. This will allow them to remain 'up to date' with changes in legislation and professional practice.

Construction trades workers and labourers should also receive refresher training or regular training updates either through an in-house planned programme of learning and development, or a more formal skills-based training programme.

Employers and all those with designer duties must satisfy themselves that businesses that they engage or appoint are competent. This means making reasonable enquiries to check that the organisation or individual is competent to do the relevant work and can allocate adequate resources to it. Those taken on to do the work must also be sure that they are competent to carry out the required tasks before agreeing to take on the work.

Performing an assessment requires a judgement as to whether the organisation or individual has the competence to carry out the work safely. The judgement should be is reasonable, taking into account the evidence that has been asked for and provided.

How to assess the competence of organisations

Competency assessments of organisations (including Integrating Organisation, Tier 1 Work Package Contractors, sub-contractors, designers and design co-ordinators) should be carried out as a two-stage process:

Stage 1: An assessment of the company's organisation and arrangements for health and safety to determine whether these are sufficient to enable them to carry out the work safely and without risk to health.

Stage 2: An assessment of the company's experience and track record to establish that it is capable of doing the work; it recognises its limitations and how these should be overcome and it appreciates the risks from doing the work and how these should be tackled.

In order to provide more consistency in the way in which competency assessments of companies are carried out, a set of 'core criteria' are set out in Appendix 2. Stage 1 and Stage 2 assessments should be made against these core criteria.

Organisations who are bidding for work should put together a package of information that shows how their own policy, organisation and arrangements meet these standards. If regularly updated, this information should then be used each time they are asked to demonstrate competence as part of a tender process.

Alternatively, organisations may use an independent accreditation organisation to assess their competence against the elements of the core criteria. Where this route is adopted, both SKAO and organisations putting themselves forward for assessment should satisfy themselves that the accreditation body is using the criteria in Appendix 2 as a basis for the assessment, and that the assessment process is robust enough to give the assurance necessary to ensure compliance.

Small companies may not have a written health and safety policy, organisation and arrangements, but they do need to demonstrate that their policy, organisation and arrangements are adequate in relation to the type of work they do. This could be done through an oral briefing, but assessments of competence will be made easier if procedures are clear and accessible. For small companies the assessment should be simple and straightforward, and they should be able to show that they meet the criteria without the need for extensive paperwork.

Where the work is much larger than any that the organisation being assessed has worked on before, or where the work will involve them managing new risks, this should not automatically rule them out for consideration for the work. The assessor should look for an appreciation of these risks; an understanding of how they will be managed, and some indication of how any shortcomings in their current arrangements for managing such risks will be addressed.

It may be that an organisation is weak in certain areas. This can be addressed by putting arrangements in place to cover these weaknesses, or by employing people with particular expertise for relevant parts of the contract. What really matters is that the organisation has access to the expertise which it needs, and the ability to control the risks which arise from the work.

Remember that assessments should focus on the needs of the particular project and be proportionate to the risks, size and complexity of the work. Unnecessary bureaucracy associated with competency assessment can obscure the real issues and divert effort away from them.

How to assess the competence of individuals

The information in this section will help clients, design co-ordinators or others who control the way in which design and/or construction work is carried out to assess the competence of key individuals. When assessing the competence of an organisation or company using the core criteria in Appendix 2, Stage 2 requires an assessment of individuals' qualifications and experience. The advice given in this section should be used to carry out such assessments.

Remember that assessments should focus on the needs of the particular job and should be proportionate to the risks arising from the work.

As with organisations, assessing the competence of an individual should be a two-stage process:

(a) Stage 1: An assessment of the person's task knowledge to determine whether this is sufficient to enable them to carry out the work safely and without risk to health;

(b) Stage 2: An assessment of the individual's experience and track record to establish that they are capable of doing the work; they recognise their limitations and how these should be overcome and they appreciate the risks from doing the work and how these should be controlled.

Stage 1 assessments will look at an individual's qualifications and training records, and arrangements which have been made for their Continuing Professional Development or lifelong learning. This will include an assessment as to whether the individual has a basic understanding of the hazards and risks arising from design and/or construction work which is essential for all people who work on or regularly visit sites.

Stage 2 assessments should concentrate on the person's past experience in the type of work which they are being asked to do.
Where the work is more complex than any that the person has done before, or where the work will expose them to new risks, this should not automatically rule them out for consideration for the work. In these circumstances, the assessor should look for an appreciation of these risks; an understanding of how they will be managed, and some indication of how any shortcomings in their current knowledge will be addressed. Working under the supervision of someone who is competent and familiar with the work is one way in which people can learn how to do work safely.

Assessing an individual's basic understanding of design and site risks
A basic understanding of the general risks arising from design and/or construction work is essential underpinning knowledge for everyone who works in the industry in order that they can protect their own health and safety and understand the effect that their own actions could have on others. This is particularly important for those who will regularly visit or work on construction sites. This basic understanding should be the foundation for health and safety knowledge and understanding on which more detailed competencies are developed.

Those who are new to construction work will need close supervision by an experienced person until they can demonstrate that they are aware of these risks and know how to avoid harm.

Assessing the competence of individual designers and design co-ordinators
When carrying out an assessment for designers or design co-ordinators, membership of a relevant design or construction-related professional institution gives a strong indication that the person has the necessary task knowledge and experience needed to fulfil the role. Some institutions have different levels of membership which may give a clearer indication of the knowledge which they possess. Fellowship of an institution generally indicates that a member has more in-depth knowledge and experience of a subject than that held by an ordinary member.

Competence of individual designers
Membership of a relevant professional institution is a strong indicator that a designer has the necessary task knowledge and an ability to recognise the health and safety implications of their design work. Membership of a relevant register administered by such an institution gives a more detailed indication that the designer has the necessary knowledge and experience.

Those who specify materials, equipment and standards of finish (for example interior designers) are also considered designers, but they tend not to be members of specific professional institutions. Relevant academic qualifications or evidence of their past experience in this type of work will give a strong indicator as to their competence.

Those who only occasionally become involved with design work and who do not meet the qualifying criteria (for example trainees) should work under the supervision of a competent designer.

When carrying out Stage 2 of the assessment organisations should consider the designer's past experience in the type of work which they are being asked to do. Those without relevant experience should be allowed to work under the supervision of someone who has it. If designers work as part of a team, different individuals may bring different skills and knowledge to the work, and this should be taken into account when making the assessment.

Assessing the competence of individual design co-ordinators
Design co-ordinators need good interpersonal skills in order to encourage co-operation between designers and others. Although the SKAO require everyone to co-operate with all involved in the project, a design co-ordinator has a specific duty to ensure that co-operation happens. Without it, good working relationships, clear communication and sharing of relevant information will not happen. An over-bureaucratic approach should be avoided, not least because it makes it harder to secure the co-operation which is needed.

Design co-ordinators also need a sound understanding of:
(a) health and safety in design and/or construction work;
(b) the design process;
(c) the importance of co-ordination of the design process, and an ability to identify information which others will need to know about the design in order to carry out their work safely.

This knowledge needs to be relevant to the project and future maintenance, use, refurbishment or demolition of the structure. The size and complexity of the project will determine whether an individual is capable, and has the resources to carry out all of the work required.

Design co-ordinators are not necessarily designers, and do not have to undertake any design work themselves. But in order to assess the health and safety implications of the design, they must have sufficient knowledge of the design process to enable them to hold meaningful discussions with designers, recognise when information about risks arising from the design will need to be passed to others and participate fully in relevant design team meetings.

When carrying out the assessment, management will need to take into account the size and complexity of the project, and the nature of the risks which will be associated with it. Where one individual does not possess all of the skills and experience necessary, the work can be shared with others, but it must be clear who is responsible for each part of the work, and who is in overall control.

For small projects where there are no special risks, Stage 1 of the assessment should concentrate on the person's knowledge of the construction processes and the health and safety risks associated with the work. An appropriate health and safety qualification will demonstrate that the person has adequate knowledge of health and safety, but this will need to be coupled with a Stage 2 assessment to demonstrate that they have experience in applying this knowledge in the construction environment.

For larger or more complex projects, or for those with unusual or higher risks, the skills and knowledge of the design co-ordinator will need to reflect the complexity of the project and the specialist knowledge necessary to ensure that risks are properly controlled. It is more likely in these circumstances that a corporate appointment will be made and the competence assessment will be made against the core criteria. The table in Appendix 2 gives further guidance on the standards to be achieved for design co-ordinators appointed to this type of project.

Design co-ordinators cannot carry out their duties effectively without the support from employer leaders. For that reason they will often need an understanding of relevant aspects of the business and the implications of the proposed work for it. Design co-ordinators will need to make sure that employers understand their own role and duties as well as the benefits of good management of the project and early appointment of dutyholders.

All designers, contractors and other team members that organisations propose to engage are must be competent (or work under the supervision of a competent person), adequately resourced and appointed early enough for the work they have to do.

7.3 Awareness

Every worker should be made aware of:

- The SKAO HSE policy and objectives;
- The Integrating Organisation HSE management system;
- Their contribution to the effectiveness of their employer's HSE management system, including the benefits of improved HSE performance;
- The implications and potential consequences of not conforming to the Integrating Organisation HSE management system requirements;
- Incidents and the outcomes of investigations that are relevant to them;
- Hazards, HSE risks and actions determined that are relevant to them;

Workers must be able to stop working without fear of reprisal if they consider that the work presents an imminent danger to their health and safety.

In addition to workers, contractors, visitors and other interested parties should be aware of the HSE risks to which they are exposed and should also be apprised of all issues relating to the HSE management system and HSE performance of the organisation.

Awareness training should take account of individual worker capabilities such as literacy, language skills and maturity.

HSE awareness can be promulgated by internal communication, visual signs and banners, campaigns, training or education, and mentoring.

7.4 Communication

7.4.1 General

Partner, stakeholder and supplier organisations must establish, implement and maintain a process or processes for internal and external communications relevant to their HSE management system, which provides for the gathering, updating and dissemination of information and which encompasses the following:

- What topics to communicate on;
- When to communicate;
- With whom to communicate (e.g. internally within the organisation and/or externally with contractors, visitors and other interested parties);
- How to communicate.

Communications should be appropriate, comprehensible and intelligible for the audience at which it is aimed and take into account diversity aspects such as gender, language, culture, literacy and disability. The organisation should also take into account legal and other requirements and ensure that the information to be communicated is consistent with information generated within the Integrating Organisation HSE management system and is reliable.

Information transmitted by internal or external communications, of interest to relevant interested parties, must be available when required.

The organisation must retain documented information as evidence of its communications, as appropriate.

7.4.2 Internal Communication

It is critically importance to effectively communicate information about HSE risks and their HSE management system, including changes to the Integrating Organisation HSE management system, at various levels and between various functions of the organisation.

This should include information relating to:

- Management's commitment to the HSE management system;
- The identification of hazards and risks;
- HSE objectives and programmes to achieve them;
- Incident investigation;
- Progress in eliminating hazards and associated HSE risks;
- Operational changes that might impact the HSE management system;
- Progress with consultation and participation of workers;

7.4.3 External Communication

Partner, stakeholder and supplier organisations should have a process in place for receiving, documenting and responding to relevant communications from external interested parties, where appropriate. Paramount to this is the development and maintenance of a process for communicating with contractors and other visitors to the workplace. The extent of this communication should be related to the HSE risks faced by these parties and will be further considered in section 8.1.4.2 of the standard.

Service level agreements (SLAs), contracts and pre-project HSE planning meetings are often used to communicate on HSE issues to external providers such as contractors, but the organisation should also use methods such as on-site induction to raise HSE awareness amongst contractors' workers.

In addition to communicating about specific HSE requirements relating to on-site and off-site activities, the following should also be taken into account when communicating with external providers, particularly contractors:

- Information about a contractor's HSE management system;
- Legal and other requirements that impact on the method or extent of communication;
- Previous HSE performance and history of notifiable incidents;
- The use of multiple contractors at the workplace;
- Emergency response;
- The need for alignment of the contractor's HSE practices with those of the organisation and other contractors at the workplace;
- The need for additional consultation and/or contractual provisions relating to high-risk tasks;
- Reporting of HSE performance, incidents, nonconformities and corrective actions;
- Arrangements for regular communications.

For visitors such as delivery companies, clients, members of the general public and service providers specific HSE information needs to be communicated as follows:

- HSE requirements relevant to their visit;
- Evacuation procedures and responses to alarms;
- Traffic controls;
- Access controls and escort function;
- Details relating to the wearing of personal protective equipment (PPE).

External communication processes often include the identification of designated contact personnel from within the organisation. This allows for appropriate information to be communicated in a timely and consistent manner. This can be especially important in emergency situations where regular updates are required to be delivered in a clear and unambiguous manner.

7.5 Documented information

7.5.1 General

It is important for top management to ensure that the HSE processes are carried out as planned and the desired results are achieved. Capturing key pieces of information in documented form can assist in this effort. Documenting how the system works helps personnel responsible for its implementation understand what they need to do and how to do it. Where a number of people are performing a process, documenting the steps can ensure consistency in the results. Documenting decisions made, HSE activities performed and the resulting outcomes provides evidence to demonstrate conformity to requirements and the effective implementation of the Integrating Organisation HSE management system.

Mandatory documents include the documented information required by [RD2] ISO 45001 and additional information identified by the organisation as necessary for the effective operation of its HSE management system.

The extent of documented information for an HSE management system can differ from one organisation to another due to:

- The size of the organisation and the type of activities, processes, products or services it is engaged in;

- The need to demonstrate fulfilment of legal and other requirements;
- The complexity of the organisation's processes and how they interact;
- The competence of workers.

[RD2] ISO 45001 has moved from prescriptive requirements for specific 'documents' and 'records' towards the more inclusive term 'documented information'. This allows the organisation to customise its occupational health and safety documentation to better reflect its particular circumstances. There are now basically two types of documented information; "living" documents that describe how things are done within the HSE, and "static" records that reflect results of some activity at a particular point in time. Whether in electronic or paper format, the correct and current versions of living documents, be they procedures, work instructions, process maps, plans or programmes, need to be available to those who use them. This requires the organisation to have a process to create these documents and control their revision. Records of results need to be created, reviewed, and retained for a period of time.

The organisation should attempt to keep the complexity of the documented information at the minimum level necessary to ensure contemporaneous effectiveness, efficiency and simplicity. It should be noted that an Occupational Health and Safety Manual is no longer required by [RD2] ISO 45001, but most organisations are likely to persevere with it as an integral part of their HSE management system.

7.5.2 Creating and updating

When creating and updating documented information, the organisation must ensure appropriate:

- Identification and description (e.g. a title, date, author or reference number);
- Format (e.g. language, software version, graphics) and media (e.g. paper, electronic);
- Review and approval for suitability, adequacy and effectiveness.

7.5.3 Control of documented information

Partner, stakeholder and supplier organisations is required to control documented information in order to ensure that it is available where needed and that it is suitable for use. It must also be adequately protected against improper use, loss of integrity and loss of confidentiality.

With reference to documented information the organisation must make decisions on its:

- Distribution, access, retrieval and use;
- Storage and preservation;
- Control of any changes;
- Retention and disposal.

The organisation is also required to identify any documented information of external origin that is considered essential for the planning and operation of its HSE management system and ensure that it is controlled.

All of the controls described are primarily aimed at preventing unintended use of obsolete documented information.

8 Operations

This section provides guidance on the future operational planning and control necessary for a future SKAO Operations HSE management system which includes eliminating hazards and reducing HSE risks, managing change, emergency preparedness and response as well as guidance on procurement, contractors and outsourcing.

The SKAO acknowledge and, where applicable, reference existing and previous work of SKA precursor and pathfinder sites (primarily, but not limited to those in Australia and South Africa).

8.1 Operational planning and control

The SKAO maintenance strategy minimises number of operational staff working on sites, partly also to minimise personnel exposure to hazardous environmental conditions presented by sites.

SKA Project HSE Management programme shall ensure safety, security and environmental compliance of maintenance on the Telescopes.

Health, Safety and Environmental (HSE) Management will be integrated into the telescopes' maintenance products and programmes, ensuring HSE compliance.

The maintenance programme will include upkeep and maintenance management of HSE equipment.

For safety and/or engineering requirements, it will always be possible for an Operator to take manual control of the telescope, its subarrays, components and instrumentation.
Furthermore, it will be possible to secure manual control at several levels:

- by manually requesting inclusion of an engineering, or related, operation within the schedule;

- by manually editing the execution schedule to insert an automated operation at a future point in time (by either sending an SB or engineering operation for execution); or
- by performing manual low-level control of the telescope.

Other manual operation controls may be identified through the course of operating the telescopes that will need to be added.

SKAO operational HSE Management implementation will account for Telescope maintenance access essential to meet availability requirements. There will be ongoing interaction to align HSE management approach and maintenance to achieve this objective.

Definition of maintenance procedures on the Telescopes are still to progress as part of Construction Phase support data delivery.

Safety compliance in the maintenance mode at this stage need to reference SKA HSE management program process to establish the SKAO maintenance safety case.

Latter processes will address:

i. Systematic hazards assessment traceable to the SKAO fault finding and maintenance procedures – for the Telescopes' comprehensive hardware, software and the interaction of software and hardware.
ii. Compliance with host country safety standards and related statutory requirements for design for maintenance safety, maintenance safety process and maintainer protection.
iii. Mechanism to focus and prioritise areas justifying detailed safety analysis, including damage mode analysis.
iv. Accounting for statutory certification requirements for designs, equipment, installations and personnel.
v. Development of maintenance safety procedures.
vi. Process to track effectiveness of hazard mitigations on the Telescopes.
vii. Directives for ensuring safety during the construction and commissioning stages whilst mitigations still in progress of definition, implementation or verification.
viii. Definition of the format and process according to which SKAO Operations will accept and take on results of the SKA Safety Management Programme as part of the Observatory Operational Baseline.

8.1.1 General

Processes will be established to enable the Operational HSE management system to achieve its intended outcomes and these processes will be controlled.
Examples of the processes needed will include, but are not limited to those for:

a) consultation and participation of workers;
b) hazard identification and risk assessment;
c) determination of, and compliance with, legal requirements and other requirements;
d) communication;
e) management of change;
f) emergency preparedness and response; and
g) monitoring, measurement, analysis and performance evaluation.

Controls and criteria relating to those processes will include, for example:

1. documentation and detailed systems of work;
2. specifications for the procurement of goods and services;
3. ensuring compliance with regulations and manufacturers' instructions;
4. checking and raising the competence of workers;
5. maintenance and inspection programmes, e.g. routine housekeeping;
6. health surveillance, work permits; and
7. adapting work to workers, e.g. reasonable adjustments for workers with specific needs,
8. appropriate design of workplaces, etc.

When planning and developing operational controls, priority will be given to control options with higher reliability in preventing work related injury and ill health.

The controls will take into account both existing processes and any new processes introduced to achieve the SKAO's HSE objectives.

8.1.2 Eliminating hazards and reducing HSE risks

HSE risks are commonly managed using a system called the hierarchy of controls. The hierarchy of controls provides a structured guide to eliminating hazards and reducing or controlling HSE risks. Each step is less effective than the one before, although several steps can often be combined to effectively reduce risks to a level that is as low as reasonably practicable.

When deciding what is reasonably practicable, best practices and technological options should be taken into account, together with financial, operational and business requirements.

The following examples illustrate control measures that can be implemented at each level:

a) hazard elimination: removing the hazard completely, e.g. through workplace re-design or process change;
b) substitution: if a hazard cannot be removed, replacing the dangerous by the non-dangerous, or the less dangerous; e.g. using water-based paint rather than solvent-based paint, or buying pre-cut building materials instead of cutting on-site;

c) engineering controls/work reorganisation: if a hazard cannot be removed completely or replaced with something less harmful, practical changes can be made to reduce the risk, e.g. machine guarding or local exhaust ventilation systems, providing physical separation of pedestrians and vehicles, alarms, changing working hours, reducing the effect of monotonous activities by rotating workers;
d) administrative controls/training: e.g. safety signs, using standard operating instructions, emergency instructions, training in manual handling or to recognize the symptoms of stress; and personal protective equipment (PPE): e.g. hard hats, safety shoes, hearing protection.

The control measures will be checked, as necessary, to make sure they work as well as intended and to see if any better ways of controlling the risks can be implemented.
It is also important to regularly check that any equipment used as a control works properly, e.g. machinery guarding, interlocks, fire alarms, sprinklers, carbon monoxide monitors.

Administrative controls should also be evaluated, e.g. floor walking to check workers are following work instructions, consulting with workers to ensure no one is working excessive hours or skipping breaks.

8.1.3 Management of change

SKAO operational planning will plan for change and ensure sufficient resources are available to make sure that changes do not introduce new and unforeseen hazards or increase the HSE risks.
Planned changes will also give SKAO, partners, stakeholders or suppliers the chance to implement opportunities for improvements.

8.1.4 Procurement

8.1.4.1 General

SKAO procurement processes will be used to control potential hazards and reduce HSE risks associated with something being introduced into the workplace, e.g. products, raw materials, substances, new equipment, services, etc.

Before use, the SKAO will check that what has been procured is suitable and any related hazards or HSE risks are at an acceptable level.

For example, the organisation will put in place an operational process to check that:
a) equipment is delivered according to specification and tested to ensure it works as intended;
b) installations function as designed;
c) materials are delivered according to their specifications; and
d) usage requirements, precautions or other protective measures are available and communicated to workers and others who could be affected.

8.1.4.2 Contractors

The SKAO may delegate authority to those best capable of identifying, evaluating and controlling HSE risks, including, where necessary, contractors with specialised knowledge, skills, methods and means.
SKAO notes that that this delegation does not eliminate the responsibility for the health and safety of its workers.

Contracts that clearly define the responsibilities of everyone involved will help SKAO to manage contractors' activities effectively (e.g. use of NEC4).

Contract award mechanisms or pre-qualification criteria which take account of past HSE performance, safety training, or health and safety capabilities, as well as direct contract requirements, will be utilised.

How the SKAO manages often diverse and complex relationships with contractors may vary, depending on the location, nature and extent of the services provided and the associated hazards and risks.

When deciding how to coordinate, the SKAO will consider factors such as:
a) reporting of hazards between itself and its contractors;
b) controlling worker access to hazardous areas and activities;
c) reporting contractor or interested party injuries and/or ill-health; and
d) processes to follow in emergencies.

8.1.4.3 Outsourcing

When an organisation outsources activities, e.g. billing, printing, internal auditing, welding, galvanizing, chrome plating, spray painting, rather than carrying them out internally, it still retains responsibility for HSE risks and ensuring appropriate controls are in place.

An outsourced function or process is one that:
a) is integral to the organisation's functioning;
b) is within the scope of the HSE management system; and
c) is perceived by interested parties as being carried out by the organisation itself.

The type and degree of control to be applied to outsourced functions and processes will be defined within the Operations HSE management system and the SKAO will put in place appropriate controls both to make sure that the external provider understands what is needed and to assure the organisation that this is being carried out in an acceptable way.

Controls may include such things as contractual requirements, training, inspections and risk assessments.

8.2 Emergency preparedness and response

8.2.1 General

The SKAO have identified potential emergency situations and plans in response in proportion to the risk - refer to [RD18] and [RD26].
The SKAO will focus on proactive control measures (e.g. the elimination of ignition sources), as well as reactive risk controls (e.g. fire-fighting equipment and evacuation).

In planning its emergency response, the SKAO will take account of the needs of relevant interested parties, e.g. workers, visitors, emergency services and neighbours. The identified emergency situations should be subject to regular review, taking into account the potential impact of any changes to processes or systems of work (see 8.1.3).

When planning, the SKAO will take into account previous similar emergencies and the findings of any associated investigation as well as general considerations of its own situation, including:

a) numbers and locations of workers and other people who could be affected;
b) availability of local emergency services and details of any emergency response arrangements in place; and
c) competence of workers and needs of vulnerable people.

Emergency plans will be made available to all workers, visitors and contractors, including individual copies for workers with specific roles and responsibilities. SKAO will ensure the plans are kept in accessible locations and in different media, e.g. physical copies such as posters or printed instructions in case of power failure, as well as electronic copies that can be accessed remotely.

The emergency plans will describe the roles, responsibilities and authorities of those with specified duties, identified by job role, rather than by name.
Guidance will be given as to what is considered an emergency, who has the authority to declare an emergency, how it is to be communicated to workers and other relevant interested parties, including all relevant emergency services.

Instructions will contain actions to be taken in an emergency by those affected, including how to raise the alarm and call for help, evacuation procedures, and locations of safe places, utility isolation points, emergency equipment, up-to-date site plans and who has an emergency role. Every worker with specific roles and responsibilities for emergency response will be competent to fulfil them. A number of workers may be trained to undertake the role of emergency controller with the objective that, in the event of an emergency, one worker takes the team leader role supported by the other trained workers.

If required, control centres will be placed in a location unlikely to be affected by a major emergency, e.g. a large fire, explosion or release of a hazardous substance.

If the level of risk identified is significant the response team may be structured on three levels; the top level dealing with strategic control, the second dealing with operational control and the third with control matters at the location of the emergency.

Emergency response equipment and supplies will be located in secure and easily accessible places, protected from damage. The equipment will be subject to regular testing to ensure that it is working. People who are designated to use the emergency equipment should have regular refresher training.

Periodic testing of emergency plans will be implemented to ensure that the SKAO, its workers and, where necessary, the relevant emergency services can appropriately respond to the emergency situation. In low risk environments, this might simply be a periodic fire evacuation drill.

It is essential that those with specific roles and responsibilities are fully involved in testing, the results of which can be used to identify, and therefore correct, any deficiencies.

The results of the testing and any corrective actions should be kept as documented information. This information will be reviewed with the test planners and participants, SKAO Director of Operations and HoHSSE to share feedback and recommendations for further improvement.

8.3 Engineering Operations Forums

A well-managed maintenance and support operational organisation is needed to achieve the operational availability goals. Engineering Operational Systems must be implemented to ensure an optimal maintenance and support environment. The engineering procedures must be defined and implemented to:

- Ensure that the support system meets operational availability requirements
- Correcting and evaluating operational data
- Ensure that the software support systems are properly and correctly implemented
- Ensure that operating principles are integrated throughout the project

- Ensure a smooth transition from project to the operational environment

An SKA MeerKAT Engineering And Site Operations Forum (SMEOF) has been set up to exchange information between SKA and SARAO. This forum will support the operations agreement between the organisations. It will focus on the procedures and software systems required during the operation of the MID Telescope. It is important to note that the structure of the forum may evolve depending on any change in the requirements.

The forum will focus on implementing the operational activities of the MID Telescope and can impact on the Observatory's policies, standards and guidelines. It is meant that the work will not affect the current MeerKAT operations and that it will be conducted in the context of the future operations agreement between SKA and SARAO.

The purpose of the forum is to:

- Establish a working relationship between the SKA and SARAO
- Identify the activities to be performed
- Prioritise the work to be performed
- Evaluate and monitor the activity status
- Exchange information, learn from MeerKAT operations
- Align the processes and approach between the organisations
- Define the procedure requirements for engineering and site operations
- Develop an engineering and site “Operational dossier"
- Develop a Support Integration Plan.

An analogous forum to exchange information between SKA and CSIRO, focusing on implementing the operational activities of the LOW Telescope and how it may impact on the Observatory's policies, standards and guidelines, will also be set up.

8.3.1 Engineering Operations Safety Work Groups

The forums will consist of a management committee and five (5) working groups, one of which is dedicated to HSE activities.
A management committee will have the responsibility to guide, prioritise and monitor the work performed by the working groups.
The working groups will provide inputs to the management committee.
The management committee will be responsible for all deliveries and inputs.
The Safety Work Group leader (usually HoHSSE) will attend, as and when necessary, the management committee meetings.

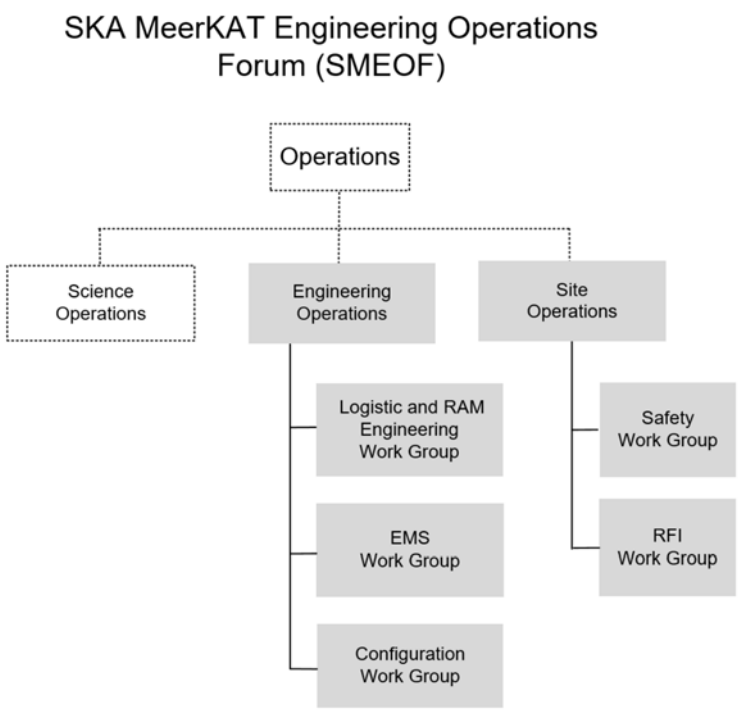


Figure 6: Example Engineering Operations Forum structure.

.

HSE issues under review include, but are not limited to:

- SARAO (and CSIRO) safety procedures and developing applicable procedures for the SKA Observatory,
- SARAO (and CSIRO) maintenance safety aspects and developing applicable procedures for the SKA Observatory,
- SARAO (and CSIRO) safety training and developing applicable training for the SKA Observatory.

9 Performance Evaluation

During construction and Operations the SKAO will have a systematic approach for measuring and monitoring its HSE performance on a regular basis, as an integral part of its management system (to be developed in revision 4 and 5 of this HSE Plan).

This section provides guidance on evaluating the performance of the HSE management system.

This section encompasses the following:

- Monitoring, measurement, analysis and performance evaluation;
- Internal audit;
- Management review

9.1 Monitoring, measurement, analysis and evaluation

9.1.1 General

The organisation needs to monitor and measure the following in order to determine the performance of the HSE and evaluate its effectiveness:

- The extent to which legal and other requirements are fulfilled including, where applicable, all applicable HSE legislation, collective agreements, standards and codes and insurance requirements;
- Characteristics of activities and operations related to the identified hazards, risks and opportunities;
- Progress in the achievement of the organisation's HSE objectives;
- Effectiveness of operational and other controls.

This includes the determination of the criteria against which the organisation's HSE performance will be evaluated, including appropriate indicators. Criteria are what the organisation uses to compare its performance against (e.g. benchmarking its HSE performance against other organisations, standards or codes, etc.).

To measure criteria, indicators are used. For example, if the criterion is a comparison of incidents, the organisation could choose to look at frequency, type, severity or number of incidents; the indicator could be the determined rate within each one of these criteria.

The organisation must select appropriate methods for monitoring, measurement, analysis and performance evaluation in order to ensure valid results, decide when the monitoring and measurement will be performed and when the results from monitoring and measurement will be analysed, evaluated and communicated.

The organisation must ensure that monitoring and measurement equipment such as sampling pumps, noise monitors, toxic gas detection equipment, is calibrated or verified and that it is correctly used and maintained.

Insofar as measuring and monitoring are concerned, the organisation should use both reactive and proactive measures of performance but should mainly focus on proactive measures in order to drive HSE performance improvement.

Examples of proactive measures include:

- Assessment of compliance with legal and other requirements;
- Evaluation of the effectiveness of HSE training;
- Use of worker surveys to evaluate HSE culture and related worker satisfaction;
- Completion of statutory and other inspection schedules;
- The extent to which programmes have been implemented;
- The effectiveness of the worker consultation and participation process;
- Use of health screening.

Examples of reactive measures include:

- Occurrence and rates of notifiable accidents and dangerous occurrences;
- Lost time incident rates;
- Monitoring of ill health;
- Actions required following assessments by regulatory bodies such as the HSA/HSE.

The organisation must retain appropriate documented information as evidence of the results of monitoring, measurement, analysis and evaluation and of the maintenance, calibration or verification of measuring instruments

9.1.2 Evaluation of compliance

The organisation must establish, implement and maintain a process for periodically evaluating its compliance with the legal and other requirements that are applicable to its HSE risks, as part of its commitment to compliance. The organisation can decide to combine these

evaluations or establish separate processes. This section complements section 6.1.3: Determination of legal requirements and other requirements.

The organisation must:

- Determine the frequency and method for the evaluation of compliance;
- Evaluate compliance and take action if needed;
- Maintain knowledge and understanding of its compliance status with legal and other requirements.

A compliance evaluation programme can encompass multiple (all occupational exposure legislation) or a single legal requirement. The frequency of evaluation can be affected by factors such as past compliance performance or the frequency at which legislation is enacted or modified.

A compliance evaluation programme can be integrated with other assessment activities. These can include management system audits, environmental audits or quality assurance assessments.

It should be noted that legal compliance is the minimum standard in determining the effectiveness of the HSE management system.

The organisation must retain documented information of the compliance evaluation results.

9.2 Internal audit

9.2.1 General

Inspections and audits required on the site are:

- Informal daily site inspections.
- Formal site inspections.
- Integrating Organisation self-audits.
- SKAO HSE Officer Audits.
- Contractor Audits.
- Safety Interactions.

Inspections and audits will cover but not be limited to plant and equipment, work methods, tools used, storage facilities and maintenance activities, housekeeping, access & egress, contingency systems, competencies of staff, PPE, behaviour, risk assessment and safe work procedure reviews etc.
Formal site inspections and audits shall be planned, scheduled and executed accordingly.

All information regarding the deviation, the rectification and remedial actions resulting from inspections and audits shall be captured on a suitable register for tracking and close-out.

The Integrating Organisation is responsible for said register and will require from Contractors' HSE personnel to provide or capture the necessary information accordingly.

9.2.2 Internal audit programme

A suitable monitoring plan will be submitted by the Integrating Organisation and accepted by SKAO HSE Manager, prior to construction activities equal to (or equivalent) to that in Table X (below)

Table 1 : Example Construction Monitoring Plan

	Conducted by	Construction Pre-start	Daily	Weekly	Monthly	Three monthly	Six monthly
Tier 1 Contractors Site Inspection: Construction Manager/ Assistant Construction Manager, Safety Representatives and HSE personal	Integrating Organisation Tier1 Contractors		X	X			
Engineer Inspections:	Integrating Organisation		X	X			

Project Manager, Inspectors, HSE staff							
Safety Interactions: Management, Middle Management, Supervisors, HSE staff	Integrating Organisation Tier1 Contractors		X				
Tier 1 Contractor Procedures Audit: Contractor HSE Advisor					X		
Tier 1 Contractor HSE Management Systems Audit: Contractor HSE Advisor		X					X Yearly
RAMS and SWP Reviews Construction Supervisors and HSE personal	Integrating Organisation Tier1 Contractors					X According to an agreed schedule	X According to an agreed schedule
HSE Agent Audits	Agent				X		
Tier 1 Contractor Audits: HSE personnel	Integrating Organisation				X		
PTO	Integrating Organisation Tier1 Contractors		X According to an agreed schedule				

The Integrating Organisation shall have a schedule for conducting Planned Task Observations (PTO's) to be done by the Construction Manager, Assistant Construction Managers, Construction Supervisors, specific Competent Persons appointed and HSE personnel.

Where necessary this will also cover Contractors' work. Conducting PTO's must be covered in the project's induction (purpose etc.), but a separate training schedule must be held for the relevant person who will conduct PTO's.

The format of a PTO must follow the same detailed headings / aspects of the respective task's risk assessment and safe work procedure. Therefore, no generic PTO's will be allowed.

10 Improvement

This section provides guidance on making improvements to an HSE management system.

This section encompasses the following:

- Incident, nonconformity and corrective action;
- Continual improvement.

10.1 General

Partners, contractors and suppliers must actively seek out and, where possible, realise opportunities for improvement that will facilitate the achievement of the intended outcomes of the HSE management system.

The organisation should consider the results from analysis and evaluation of its HSE performance, evaluation of compliance, internal audits and management review when taking actions to improve its performance.

Improvement can arise from corrective action, continual improvement, breakthrough change, innovation and re-organisation.

10.2 Incident, nonconformity and corrective action

Partners, contractors and suppliers should have a process in place for reporting and investigating incidents and other nonconformities, and for taking action to correct them and deal with their consequences. Separate processes may exist for incident investigations and nonconformities

reviews, or these may be combined as a single process. It is imperative that root cause analysis be carried out on the incident or nonconformity in order to take appropriate action to prevent a recurrence.

Examples of incidents and nonconformities include but are not limited to:

- Incidents: near misses, injuries and ill-health and damage to property or equipment that could lead to HSE risks; such as a broken leg, asbestosis, hearing loss;
- Nonconformities: protective equipment not functioning properly; failure to fulfil legal requirements; prescribed processes or procedures not being followed; contractor behaving in an unsafe manner on-site.

When an incident or nonconformity occurs, the organisation must react in a timely manner, act to control and correct it and deal with the consequences.
It must evaluate the need for corrective action to eliminate the root cause of the incident or nonconformity in order to ensure that it does not recur or occur elsewhere in the organisation by:

- Investigating the incident or reviewing the nonconformity;
- Finding out what caused the incident or nonconformity;
- Finding out if similar incidents have occurred, if nonconformities exist, or if they could potentially occur.

The evaluation of the need for corrective action should be carried out with the active participation of workers and the involvement of other relevant interested parties.

The aim of an incident investigation is to determine what happened, why it happened, and what can be done to prevent it from happening again. This means not only considering the immediate causes, but also the underlying or root causes and taking corrective action to address these causes.

Almost all incidents have multiple causes. These can be related to a range of factors, including human behaviour and competency, the nature of the tasks and processes, equipment or management of the organisation. The investigation should identify all areas that need improvement including improvements to the HSE management system and propose appropriate corrective actions.

The level of investigation should be proportionate to the potential health and safety consequences of the incident. The incident should be recorded and reported internally and, where appropriate, reported externally to relevant regulatory bodies. Where practicable, the investigation should be led by a person independent of the activities being assessed and should include a worker or workers' representative.
In addition, the organisation should

- Review existing RAMS assessments for continued suitability (e.g. did the risk assessment anticipate the occurrence of the incident or nonconformity);
- Decide on and implement any action needed, including corrective action, in accordance with the hierarchy of controls (reference section 8.1.2) and the management of change (reference section 8.1.3);
- Assess HSE risks that relate to new or changed hazards, prior to taking action;
- Review the effectiveness of any action taken, including corrective action (e.g. the extent to which the implemented corrective actions adequately control the root cause);
- Make changes to the HSE management system, if necessary such as updating a process map or procedure.

Examples of corrective actions (as indicated by the hierarchy of controls) include, but are not limited to:

- Eliminating hazards;
- Substituting with less hazardous materials;
- Redesigning or modifying equipment or tools;
- Developing and implementing procedures or improving processes;
- Improving the competence of affected workers;
- Changing the frequency of use of equipment, etc.;
- Using personal protective equipment.

Corrective actions should be appropriate to the effects or potential effects of the incidents or nonconformities encountered.

Root cause analysis refers to the practice of exploring all of the possible factors associated with an incident or nonconformity by ascertaining what happened, how it happened and why it happened, to provide an input for what can be done to prevent it happening again.

When determining the root cause of an incident or nonconformity, the organisation should use methods appropriate to the nature of the incident or nonconformity being analysed. The focus of root cause analysis is prevention. Root cause analysis can identify multiple contributory failures, including factors related to communication, competence, fatigue, equipment or documentation.

While root cause analysis is being performed, the organisation may also have to undertake immediate but temporary actions to prevent the occurrence of the same nonconformity or incident. This would form part of the corrective action.

Partners, contractors and suppliers should retain documented information as evidence of:

- The nature of the incidents that occurred or nonconformities encountered, and any subsequent actions taken;
- The results of any actions and corrective actions taken, including their effectiveness.

Partners, contractors and suppliers should communicate this documented information to relevant workers, and where they exist, workers' representatives, and other relevant parties.

It is worth noting that the investigation and reporting of incidents without undue delay can enable hazards to be eliminated and associated HSE risks to be minimised as soon as possible.

10.3 Continual improvement

Organisations shall continually improve the suitability, adequacy and effectiveness of their H&S systems.

Continual improvement is a recurring activity to enhance measurable performance relating to the use of HSE systems in order to achieve improvement in overall HSE performance consistent with SKAO HSE policy and objectives.

Organisations shall plan, establish, implement and maintain a continual improvement process(es), which takes into account the outputs of the activities described in international standards such as ISO 9001, ISO 14001, ISO 27001, ISO 22301 as well as [RD2] ISO 45001 - Occupational health and management systems.

Organisations shall continually improve the suitability, adequacy and effectiveness of their HSE system to:

a) prevent occurrence of incidents and nonconformities;
b) promote a positive occupational health and safety culture;
c) enhance HSE performance.

Continual does not mean continuous so an activity does not need to take place in all areas simultaneously.

Organisations shall communicate the results of continuous improvement to its relevant workers, and where they exist, workers' representatives.
Organisation shall retain documented information as evidence of the results of continual improvement.

Examples of continual improvement opportunities include, but are not limited to:

- New technology;
- Good practices that arise internally in the organisation and externally to the organisation;
- Suggestions and recommendations from interested parties;
- New knowledge and understanding of occupational health and safety-related issues;
- New or improved materials;
- Changes in worker capabilities or competence;
- Achieving improved performance with fewer resources.

10.4 Future Project Lifecycle considerations

SKA Organisation and its staff are committed to being a leader in health, safety and environmental management and consider project safety our highest priority.

A key objective of the project is to achieve through the design, procurement and construction phases a project that delivers a safe to develop, safe to construct and safe to operate telescope systems.

Given the complexity of the project and the relatively long development lead times a plan for the future review and revision of this HSE Plan is proposed in Appendix 13 (and by implication for the review and revision of all HSE Plans).

11 Software and Safety

Components and equipment shall be designed to be locally fail-safe and not be dependent on any external inputs for safety.

SKAO assume that, during steady state operations, we will have suitable robust isolation philosophy (i.e. be locally fail-safe), operations & maintenance procedures understood and in place using competent and trained technicians and engineers.

Sufficient safety features and interlocks shall be provided such that no malfunctioning SKAO interface or software can endanger human safety (including via situations arising from equipment damage).

SKAO software shall monitor and report situations which are approaching or reaching safety limits. Automatic hardware fail-safe mechanisms shall be applied when limits have been reached and SKAO software shall be able to monitor these.

11.1 Hardware-based hazard control

The SKA project prefers hardware-based hazard controls for hardware hazards or hardware-based hazard controls in conjunction with software-based hazard controls.

In some situations, software control and hardware control could cooperate.

In exceptional circumstances a software control may be the first line of defence provided a hardware-based control as a backup is provided if the software control fails.
Any such proposed software-hardware control of a hazard risk shall require prior SKAO Head of HSSE and Project Safety Committee approval.

In addition, multiple controls may be necessary to mitigate some hazards.

11.2 SKAO interpretation of [RD4] MIL-STD-882E - Standard Practice System Safety

11.2.1 Level 5 Software Control Category – No Safety Impact

With reference to [RD4] MIL-STD-882E Table IV. Software Control Categories the following wording should be replaced, and adopted by SKAO, partners, stakeholders or suppliers for level 5 software control categories:

“Software functionality that does not possess command or control authority over safety-significant hardware systems, subsystems, or components and does not provide safety-significant information. Software does not provide safety-significant or **safety-significant** time sensitive data or **safety-significant** information that requires control entity interaction. Software does not transport or resolve communication of safety-significant or time sensitive data.”

In principle SKAO approves the use of demonstrated level 5 software control.

11.2.2 Level 4 Software Control Category - Influential

With reference to [RD4] MIL-STD-882E Table IV.

“Software generates information of a safety-related nature used to make decisions by the operator, but does not require operator action to avoid a mishap.”

Level 4 Software Control Categories may be tolerated provided an appropriate and proportionate review to demonstrate safety compliance is made available to, and formal accepted by, SKAO Head of HSSE.

11.2.3 Level 3 Software Control Category – Redundant Fault Tolerant

With reference to [RD4] MIL-STD-882E Table IV. Level 3 Software Control Categories may be accepted solely for machine protection (and provided no human factors safety critical implications can be clearly guaranteed and demonstrated).
Any proposed use of Level 3 software control category by partners, stakeholders or suppliers shall require prior SKAO HoHSSE and PSC approval.

11.2.4 Level 1 or 2 Software Control Category – Autonomous or Semi-Autonomous

With reference to [RD4] MIL-STD-882E Table IV. SKAO do not approve use of software control in category 1 or 2 (i.e. those that may be deemed autonomous or semi-autonomous).

11.3 Future review

Further formal HAZOP(s) will be held prior to publication of next revision of this HSE Plan.
It is intended the usage and implementation of MIL-STD-882E Table IV level 4 and 5 safety control category descriptions will be reviewed, and, if required, modified (e.g. to ensure SAF(e) processes are fully alignment with SKAO HSE requirements).

This may include:

- further integration of Isolation Philosophy (and processes) as developed by Operations,
- inclusion of system level FMECA (with anticipated failure modes that are exacerbated or contribute to software failures and subsequent safety critical situations),
- operator and maintainer end-user experience.

12 FUNCTIONAL SAFETY

Significant hazards for equipment and any associated control system have to be identified by the supplier, specifier or developer via a hazard analysis which should identify whether functional safety is necessary to ensure adequate protection.

12.1 Introduction

The purpose of this section is to introduce the concept of functional safety and give an overview of the [RD6] international standard IEC 61508. It
Is of particular relevance to those SKAO staff, partners, stakeholders and suppliers involved in:

- The development of electronic or programmable systems which may have safety implications, or
- drafting any other standard where functional safety is a relevant factor.

Section 12.2 of this document gives an informal definition of functional safety, describes the relationship between safety functions, safety integrity and safety-related systems, gives an example of how functional safety requirements are derived, and lists some of the challenges in achieving functional safety in electronic or programmable systems.

Section 12.3 of this document gives details of [RD6] IEC 61508, which provides an approach for achieving functional safety. The section describes the standard's objectives, technical approach and parts framework. It explains that IEC 61508 can be applied as-is to the large range of SKAO scientific and engineering activities and industrial applications.

12.2 Functional Safety

12.2.1 Definition of functional Safety

Safety can be defined as Freedom from conditions that can cause death, injury, occupational illness, damage to or loss of equipment or property, or damage to the environment.

Functional safety is the part of the overall safety that depends on a system or equipment operating correctly in response to its inputs. It is the detection of a potentially dangerous condition resulting in the activation of a protective or corrective device or mechanism to prevent hazardous events arising or providing mitigation to reduce the consequence of the hazardous event.

Examples
Functional safety relies on *active systems.* The following are two examples of functional safety:

- The detection of smoke by sensors and the ensuing intelligent activation of a fire suppression system; or,
- The activation of a level switch in a tank containing a flammable liquid, when a potentially dangerous level has been reached, which causes a valve to be closed to prevent further liquid entering the tank and thereby preventing the liquid in the tank from overflowing.

Safety achieved by measures that rely on *passive systems* is not functional safety.

- A fire resistant door or insulation to withstand high temperatures are measures that are passive in nature and can protect against the same hazards as are controlled by functional safety concepts but are not instances of functional safety.

12.2.2 Safety functions and safety-related systems

Generally, the significant hazards for equipment and any associated control system have to be identified by the supplier, specifier or developer via a hazard analysis – [RD5] ECSS-Q-ST-40-02C or equivalent.

This hazard analysis should identify whether functional safety is necessary to ensure adequate protection against each significant hazard. If so, then it has to be taken into account in an appropriate manner in the design. Functional safety is just one method of dealing with hazards, and other means for their elimination or reduction, such as inherent safety through design, are of primary importance.

The term *safety-related* is used to describe systems that are required to perform a specific function or functions to ensure risks are kept at an accepted level. Such functions are, by definition, *safety functions*. Two types of requirements are necessary to achieve functional safety:

- *safety function requirements* (what the function does) and
- *safety integrity requirements* (the likelihood of a safety function being performed satisfactorily).

The safety function requirements are derived from the hazard analysis and the safety integrity requirements are derived from a risk assessment. The higher the level of safety integrity, the lower the likelihood of dangerous failure.

Any system, implemented in any technology, which carries out safety functions is a safety- related system. The safety-related system may be separate from any equipment control system or may be included within it. Higher levels of safety integrity necessitate greater rigour in the engineering of the safety-related system.

12.2.3 Example of functional safety

Consider a machine with a rotating blade that is protected by a hinged solid cover. The blade is accessed for routine cleaning by lifting the cover. The cover is interlocked so that whenever it is lifted an electrical circuit de-energises the motor and applies a brake. In this way the blade is stopped before it could injure the operator.

In order to ensure that safety is achieved, both hazard analysis and risk assessment are necessary.

1) The hazard analysis identifies the hazards associated with cleaning the blade. For this machine it might show that it should not be possible to lift the hinged cover more than 5 mm without the brake activating and stopping the blade. Further analysis could reveal that the time for the blade to stop must be one second or less. Together, these describe the safety function.

2) The risk assessment determines the performance requirements of the safety function. The aim is to ensure that the safety integrity of the safety function is sufficient to ensure that no one is exposed to an unacceptable risk associated with this hazardous event.

The safety integrity of the safety function will depend on all the equipment that is necessary for the safety function to be carried out correctly, i.e. the interlock, the associated electrical circuit and the motor and braking system.

The harm resulting from a failure of the safety function could be amputation of the operator's hand or could be just a bruise. The risk also depends on how frequently the cover has to be lifted, which might be many times during daily operation or might be less than once a month. The level of safety integrity required increases with the severity of injury and the frequency of exposure to the hazard.

To summarise, the hazard analysis identifies what has to be done to avoid the hazardous event, or events, associated with the blade. The risk assessment gives the safety integrity required of the interlocking system for the risk to be acceptable. These two elements, "what safety function has to be performed" – the safety function requirements – and "what degree of certainty is necessary that the safety function will be carried out" – the safety integrity requirements – are the foundations of functional safety.

12.2.4 Challenges in achieving functional safety

Safety functions are increasingly being carried out by electrical, electronic or programmable electronic systems. These systems are usually complex, making it impossible in practice to fully determine every failure mode or to test all possible behaviour. It is difficult to predict the safety performance, although testing is still essential.

The challenge is to design the system in such a way as to prevent dangerous failures or to control them when they arise. Dangerous failures may arise from:

- incorrect specifications of the system, hardware or software;
- omissions in the safety requirements specification (e.g. failure to develop all relevant safety functions during different modes of operation);
- random hardware failure mechanisms;
- systematic hardware failure mechanisms;
- software errors;
- common cause failures;
- human error;
- environmental influences (e.g. electromagnetic, temperature, mechanical phenomena);
- supply system voltage disturbances (e.g. loss of supply, reduced voltages, re-connection of supply).

IEC 61508 contains requirements to minimise these failures and is described in the next section.

12.3 IEC 61508 – Functional Safety of E/E/PE safety-related systems

12.3.1 Objectives

The international standard IEC 61508, Functional safety of electrical/electronic/ programmable electronic (E/E/PE) safety-related systems aims to:

- release the potential of E/E/PE technology to improve both safety and economic performance;
- enable technological developments to take place within an overall safety framework;
- provide a technically sound, system based approach, with sufficient flexibility for the future;
- provide a risk-based approach for determining the required performance of safety- related systems;
- provide a generically-based standard that can be used directly by industry but can also help with developing sector standards (e.g. machinery, process chemical plants, medical or rail) or product standards (e.g. power drive systems);
- provide a means for users and regulators to gain confidence when using computer- based technology;
- provide requirements based on common underlying principles to facilitate:
    - improved efficiencies in the supply chain for suppliers of subsystems and components to various sectors,
    - improvements in communication and requirements (i.e. to increase clarity of what needs to be specified),
    - the development of techniques and measures that could be used across all sectors, increasing available resources,
    - the development of conformity assessment services if required.

IEC 61508 does not cover the precautions that may be necessary to prevent unauthorized persons damaging, and/or otherwise adversely affecting, the functional safety achieved by E/E/PE safety-related systems.

12.3.2 E/E/PE safety-related systems

IEC 61508 is concerned with functional safety, achieved by safety-related systems that are primarily implemented in electrical and/or electronic and/or programmable electronic (E/E/PE) technologies, i.e. E/E/PE safety related systems. The standard is generic in that it applies to these systems irrespective of their application.

Some requirements of the standard relate to development activities where the implementation technology may not yet have been fully decided. This includes development of the overall safety requirements (concept, scope definition, hazard analysis and risk assessment). If there is a possibility that E/E/PE technologies might be used, the standard should be applied so that the functional safety requirements for any E/E/PE safety-related systems are determined in a methodical, risk-based manner.

Other requirements of the standard are not solely specific to E/E/PE technology, including documentation, management of functional safety, functional safety assessment and competence. All requirements that are not technology-specific might usefully be applied to other safety-related systems although these systems are not within the scope of the standard.

The following are examples of E/E/PE safety-related systems:

- emergency shut-down system in a hazardous chemical process plant;
- crane safe load indicator;
- guard interlocking and emergency stopping systems for machinery;
- variable speed motor drive used to restrict speed as a means of protection;
- automobile indicator lights, anti-lock braking and engine-management systems;
- remote monitoring, operation or programming of a network-enabled process plant;
- an information-based decision support tool where erroneous results affect safety.

An E/E/PE safety-related system covers all parts of the system that are necessary to carry out the safety function (i.e. from sensor, through control logic and communication systems, to final actuator, including any critical actions of a human operator).

Both safety and E/E/PE safety-related systems are defined in terms of freedom from unacceptable risk of physical injury and of damage to the health of people. The harm can arise to people directly, or indirectly as a result of damage to property or the environment. But some systems will be designed primarily to protect against failures with serious economic implications.

IEC 61508 can be used to develop any E/E/PE system that has critical functions, such as the protection of equipment or products.

12.3.3 Technical Approach

IEC 61508:

- uses a risk based approach to determine the safety integrity requirements of E/E/PE safety-related systems, and includes a number of examples of how this can be done.
- uses an overall safety lifecycle model as the technical framework for the activities necessary for ensuring functional safety is achieved by the E/E/PE safety-related systems.
- covers all safety lifecycle activities from initial concept, through hazard analysis and risk assessment, development of the safety requirements, specification, design and implementation, operation and maintenance, and modification, to final decommissioning and/or disposal.
- encompasses system aspects (comprising all the subsystems carrying out the safety functions, including hardware and software) and failure mechanisms (random hardware and systematic).
- contains both requirements for preventing failures (avoiding the introduction of faults) and requirements for controlling failures (ensuring safety even when faults are present).
- specifies the techniques and measures that are necessary to achieve the required safety integrity

12.3.4 Safety integrity levels

IEC 61508 specifies 4 levels of safety performance for a safety function. These are called safety integrity levels. Safety integrity level 1 (SIL1) is the lowest level of safety integrity and safety integrity level 4 (SIL4) is the highest level. The standard details the requirements necessary to achieve each safety integrity level. These requirements are more rigorous at higher levels of safety integrity in order to achieve the required lower likelihood of dangerous failure.

An E/E/PE safety-related system will usually implement more than one safety function. If the safety integrity requirements for these safety functions differ, unless there is sufficient independence of implementation between them, the requirements applicable to the highest relevant safety integrity level shall apply to the entire E/E/PE safety-related system.

If a single E/E/PE system is capable of providing all the required safety functions, and the required safety integrity is less than that specified for SIL1, then IEC 61508 does not apply.

12.3.5 Example of functional safety revisited

The safety function requirements and the safety integrity requirements constitute the functional safety requirements specification. These requirements must be fully determined before designing the E/E/PE safety-related system.

In the example described in section 2, the functional safety requirements for the specific hazardous event could be stated as follows.

> *When the hinged cover is lifted by 5 mm or more, the motor shall be de-energised and the brake activated so that the blade is stopped within 1 second. The safety integrity level of this safety function shall be SIL2.*

The E/E/PE safety-related system includes the guard interlock switch, the electrical circuit, contactors, the motor and the brake.

12.4 IEC 61508 – Functional Safety of non- E/E/PE safety-related systems

12.4.1 Mechanical

IEC 61508 is applicable to any safety-related system that contains an E/E/PE device.

This applicability is appropriate because many requirements, particularly in IEC 61508-1, are not technology specific. Indeed, early development phases (such as initial concept, overall scope definition, hazard and risk analysis and specifying the overall safety requirements) may take place before the implementation technology has been decided.

Even during later SKA1 project phases such as engineering commissioning and operations/maintenance, specific functional safety requirements may apply directly to non-E/E/PE devices, such as mechanical components, as well as E/E/PE devices.
For example, the requirements for hardware reliability and fault tolerance in IEC 61508-2 directly relate to the properties of all components in the E/E/PE safety-related system, whether or not they include E/E/PE technology.

For low complexity E/E/PE safety-related systems, it is possible to comply with IEC 61508 while not meeting every requirement of the standard.

12.4.2 Environmental

IEC 61508 is concerned with achieving functional safety, where *safety* is defined as freedom from unacceptable risk of physical injury or damage to the health of people, either directly or indirectly as a result of damage to property or to the environment (see 3.1 of IEC 61508-4). So damage to long term health, including damage to property or the environment that leads to damage to long term health, is explicitly within the scope of the standard and is encompassed by the term *safety*.

It is recognised that the consequences of failure could also have serious economic implications and in such cases the standard could be used to specify any E/E/PE system used for the protection of equipment or product (1.2 f of IEC 61508-1).

The particular safety functions that are necessary, and the associated levels of performance required of them, are determined by hazard and risk analysis (see for example IEC 61508-5).

An equivalent analysis of risk in terms of environmental hazards should be performed by replacing safety parameters with environmental or parameters. Most of the subsequent requirements of the standard are as applicable for "environmental functions" as they are for safety functions. This includes the required levels of performance, which are expressed in terms of the average probability of a dangerous failure on demand of the safety function or the average frequency of a dangerous failure of the safety function [h-1] (see Tables 2 & 3 of IEC 61508-1).

13 PROCUREMENT

13.1 Introduction

This standard represents the minimum to be met by tier one suppliers or appointed in-kind contributors at all times, and shall in turn be cascaded down to sub-suppliers.

Pre-qualification is designed, in part, to explore the ability of an organisation to provide relevant services whilst meeting the required HSE standard.

Tender appraisal or appointment processes will include the proposals of the supplier/in-kind contributor to fully meet the standard during design, construction or other works. For each individual project, it is the responsibility of partner, stakeholder or supplier to ensure that the standard is met by, as appropriate, supporting and assisting sub-suppliers within their supply chain.

Evaluation of competence will be informed by guidance given in Appendix 2 and may be subject to review by SKAO HoHSSE (e.g. supporting Procurement Services as a member of Technical Evaluation Committee).

Attention is drawn to the following reference documents:
[RD16] South Africa - Site Information and Instructions SKA-TEL-SKO-0001040
[RD23] Australia - Site Information Document and Instructions to Contractors (TBW)

13.2 Pre-qualification

The SKAO requires potential suppliers (including in-kind contributors) to satisfy the SKAO that they have the HSE competencies, systems and resources to meet this standard were they to be allocated a project (design and/or construct). Documentation which shall be submitted by potential suppliers as part of their response to the PQQ may include:

- health and safety policy (as defined in paragraph 13.3 below);
- environmental policy (note: an integrated HSE policy is welcome);
- organisation and arrangements for implementing the H&S and the environmental policy/policies; these shall be based on a suitable system (e.g. [RD3] ISO14001 for environmental aspects; [RD2] ISO 45001 for Health and Safety; ISO 9000 for quality aspects) or a suitable equivalent standard.

Within the system the following should be readily identifiable:

- policy, organisation and arrangements;
- management commitment;
- planning;
- implementation and management control;
- monitoring; and
- continual improvement.

Note: organisations with certified management systems (health and safety, environment, quality) will be particularly welcome;

- evidence of membership/registration with a suitable management/social responsibility scheme evidence of compliance with the scheme's code of practice;
- details of HSE performance as measured during the previous five years, including initiatives taken, awards, accident and incident rates and enforcement action (i.e. KPI data on leading/positive as well as lagging/negative indicators of HSE performance);

- evidence of use of near miss reporting as a mechanism for improvement - including information on worker engagement, culture and behaviour, occupational health and rehabilitation, design, corporate and individual competence, integrated working;
- procurement arrangements, including methods for ensuring that selected sub-contractors are HSE competent;
- arrangements for benchmarking and independent verification of HSE performance; and
- evidence of an acceptance that other commitments such as to corporate responsibility do not conflict with achieving high HSE standards.

13.3 Suppliers H&S Policy

As a minimum, this shall reflect the following HSE guidance, be regularly reviewed and signed off by a senior representative of the organisation and describe:

- senior management approach to health and safety;
- director responsible for HSE;
- the link to business performance;
- objectives;
- commitment to continual improvement;
- commitment to the Respect for People code;
- employee involvement;
- employee responsibilities;
- training and competence commitment;
- communication;
- access to competent advice; and
- commitment to provide resources to implement the policy.

13.4 Suppliers Environmental Policy

This shall reflect [RD3] ISO 14001 guidance (or equivalent) standards and should be:

- appropriate to the nature, scale and environmental impacts of its activities, products, and services;
- committed to continual improvement and prevention of pollution;
- committed to comply with applicable legal requirements and with other requirements to which the organisation subscribes which relate to its environmental aspects;
- the framework for setting/reviewing environmental objectives and targets;
- documented, implemented and maintained;
- communicated to all persons working for or on behalf of the organisation;
- available to the public; and
- regularly updated and signed off by a senior representative of the organisation.

13.5 Tender

The supplier’s tender documents to the SKAO shall include:

- confirmation that previously supplied documentation (pre- qualification) remains valid or supply replacement/updated material;
- proposals to manage known or anticipated health, safety and environmental management related issues during the planned works (draft HSE plans) including management, advisory personnel and other resources and the following:
- risk assessments for significant risks;
- risk management strategies for managing significant HSE risks identified through risk assessments;
- supervisory arrangements including ratio of supervisory personnel to general personnel;
- list of operations and related method statements for high consequence (severity) risks;
- preliminary risk register;
- procedures for dealing with emergencies (security, fire, health and safety, environmental), documented in an emergency plan appended to or referenced in the HSE plans;
- evidence of compliance with all applicable HSE legislation and statutory guidance;
- demonstrate the arrangements for compliance with the SKAO HSE Plan, including an outline of the Environmental Management Plan;
- welfare arrangements in accordance with, as a minimum, national standards;

- arrangements for managing internal and external communications;
- proposed level of site HSE surveillance, including outline programmes for safety tours, detailed safety/environmental management inspections and auditing of site activities;
- details of an occupational health programme, should one already be in place;
- disciplinary procedures for enforcing compliance with the HSE plans;
- arrangements for reviewing and developing the HSE plans, keeping them up-to-date, and managing and communicating changes to such plans;
- evidence of how they will seek to attain the objectives set out in the HSE plans; and
- proposals for working with and consulting personnel, including trades unions and appointed safety representatives where applicable.
- case studies illustrating good practice on similar/relevant works; and
- business continuity plan, providing assurance that foreseeable contingencies will not have a significant adverse impact on the delivery of the specified works and services to the SKAO.

13.6 Contract

Prior to formal award of contract, or following award and prior to work commencement, the Integrating Organisation shall submit final, detailed pre-commencement HSE plans for the works (updating the plans submitted with the tender), including within the HSE plans or as an addendum the previous HSE plans submitted as part of the tender and the following (the equivalent for sub-contractors shall be method statements and the following)

Note: the SKAO (or Site Owner during Operations Phase) may provide further project-specific information in respect of conditions, arrangements, requirements which will need to be effectively incorporated in the HSE plans for site works:

- Risk assessments and method statements (comprehensive).
- Updated hazard and risk register (comprehensive).
- Updated register of environmental legislation (comprehensive);
- Updated environmental objectives and targets.
- Details of supervisory, managerial, advisory, auditing and liaison personnel and competent persons (defining competencies required). Names of the supplier-nominated director responsible for the work and appointed site person in charge.
- List of appointed sub-contractors/suppliers.
- Further information on HSE plans is given in Appendices 7 and 8.

Note: the above defined HSE plans and associated information shall be kept up-to-date, any amendments/changes shall be notified as soon as possible to the SKAO HSE Manager, Officer and NEC Supervisor.

13.7 Site Works Planning

The work of the Integrating Organisation shall be planned and documented in the HSE plans. The detail within the HSE plans shall be proportionate and determined by the extent of risk. The fine detail of the arrangements shall be documented in works RAMS which shall reflect, among other factors:

- known site conditions and adjacent works;
- risks and precautions associated with the works; and
- statutory requirements and the requirements of this standard describing:
- appointed persons and their responsibilities;
- site and works organisation and arrangements;
- relevant site information;
- safe working methods, including materials and equipment;
- monitoring arrangements;
- record keeping;
- emergency procedures and contingency plans; and
- arrangements for consulting the workforce on all of the above.

14 CONSTRUCTION SITE RISK MANAGEMENT OF HSE

14.1 HSE Plans

The detailed arrangements for complying with the standard shall be included in the Integrating Organisation's HSE plans, and associated method statements. These shall be based on comprehensive risk assessments incorporating legislative and planning requirements.

The Integrating Organisation HSE plan(s) shall be submitted to the SKAO HSE Manager and HoHSSE (copied to the appointed NEC Manager and Supervisor) for formal acceptance in good time in advance of planned commencement of work/first phase of the work.

The SKAO shall:

- Seek advice as appropriate, and evaluate submitted HSE plans and, if appropriate, request amendments to meet the standard.
- Issue formal authority to commence the planned works when HSE plans are deemed acceptable.
- Make arrangements for the periodic review of the HSE plans by the SKAO NEC Supervisor and HSE representatives, to check that they remain suitable and sufficient. If such reviews identify requirements to amend the HSE plans, the Integrating Organisation shall undertake such amendments as soon as possible, and where a phase/element of work to be covered by such revised HSE plans has not yet been started the Integrating Organisation shall endeavour to amend them prior to commencement of that phase/element

14.2 Environmental Management Plans

The detailed arrangements for complying with those environmental elements of the standard which are relevant to the planned work shall be included in Project Environmental Management Plans (EMPs).
These arrangements will be developed in the next revision of this SKAO HSE Plan. Refer to the sections below for further information on this process.

14.2.1 WBS-level Environmental and Sustainability Management System

The SKAO (and ultimately the Site Owner, on behalf of SKAO, during Operations Phase) will be responsible for developing and maintaining a programme-level Environment and Sustainability Management System (ESMS) in accordance with [RD3] ISO 14001 that sets out the framework for assuring environmental management on the programme.

The ESMS manual signposts to the various elements of the system and is referred to as the programme EMP in the Project Execution Plan. The programme-level ESMS sets out the requirements for all projects to prepare a project EMP (in accordance with the Project Execution Plan) and acts as a framework for reviewing and approving these plans.

The specific details of the ESMS plan will be developed in and included in next revisions 4 and 5 of this HSE Plan (as set out in Appendix 13).

In liaison with the SKAO HSE Manager and HoHSSE, the Integrating Organisation will conduct periodic reviews of, and amend as necessary, the ESMS to check that it remains suitable and sufficient.

14.2.2 Project Environmental Management Plan (project EMP)

The Integrating Organisation has the responsibility for developing, maintaining and implementing a project EMP reflecting the information provided and the requirements set out in the programme- level ESMS.

The project EMPs shall identify the major construction activities and the projected overarching specific environmental issues and impacts of those construction activities. Project EMPs shall also identify the mitigation measure/best practice for managing each environmental impact (each sub-supplier's contractor EMP (see below) will support the project EMP by providing work process and procedure details specific to each work activity). The preferred format for a project EMP is set out in Appendix 8 of this document.

Project EMPs shall be submitted to the SKAO HSE Manager for acceptance prior to commencement on site. Once accepted by the SKAO HSE Manager the project EMP will be submitted to the SKAO Head of HSSE for consultation in accordance with the Project Execution Plan.

Integrating Organisation HSE managers are accountable to ensure that the project EMP is developed, approved and implemented, that relevant project-specific information is made available, and that the project EMP fully reflects the requirements of the programme-level ESMS. The SKAO HSE Manager is responsible for ensuring the continuity of the project EMP if there is a change of Integrating Organisation through the phases of a project (project managers shall also ensure that all HSE information provided to any design coordinators or appointed environmental representative is accurate and up-to-date, and shall facilitate the circulation to relevant parties of information provided by any design coordinators).

The SKAO HSE Manager shall ensure that periodic reviews of EMPs are undertaken, to check that they remain suitable and sufficient. If such reviews identify requirements to amend EMPs, the Integrating Organisation shall undertake or commission such amendments as soon as possible, and where a phase/element of work to be covered by such revised EMPs has not yet been started shall endeavour to amend them prior to commencement of that phase/element.

The Integrating Organisation HSE Manager shall ensure that the SKAO HSE Manager is in possession of the current, up-to- date EMPs. The SKAO HSE Manager shall periodically review the EMPs at all levels of a project to ensure that they remain suitable and sufficient and consistent with the programme-level ESMS.

14.2.3 Contractor Environmental Management Plan (contractor EMP)

Each sub-supplier shall develop a contractor EMP that is a component of/supports the project EMP, provided to and approved by the Integrating Organisation. For each work activity, contractor EMPs shall identify specific construction work process/aspects, the environmental impact of each process/aspect, the mitigation measure/best practice and the relevant procedure or method of work to be followed. Relevant procedures or RAMS shall include any associated control plans, procedures, instruction written to deliver the stated mitigation measure or environmental best practice and may include reference to any relevant training or awareness tool.

The Integrating Organisation is responsible for engaging in procurement such that the competence of each sub-supplier to address environmental management matters is assessed and only those capable of meeting the standard are appointed.

Refer to the figure 7 below which summarises the document hierarchy and responsibilities for environmental management arrangements on the SKA1 sites.

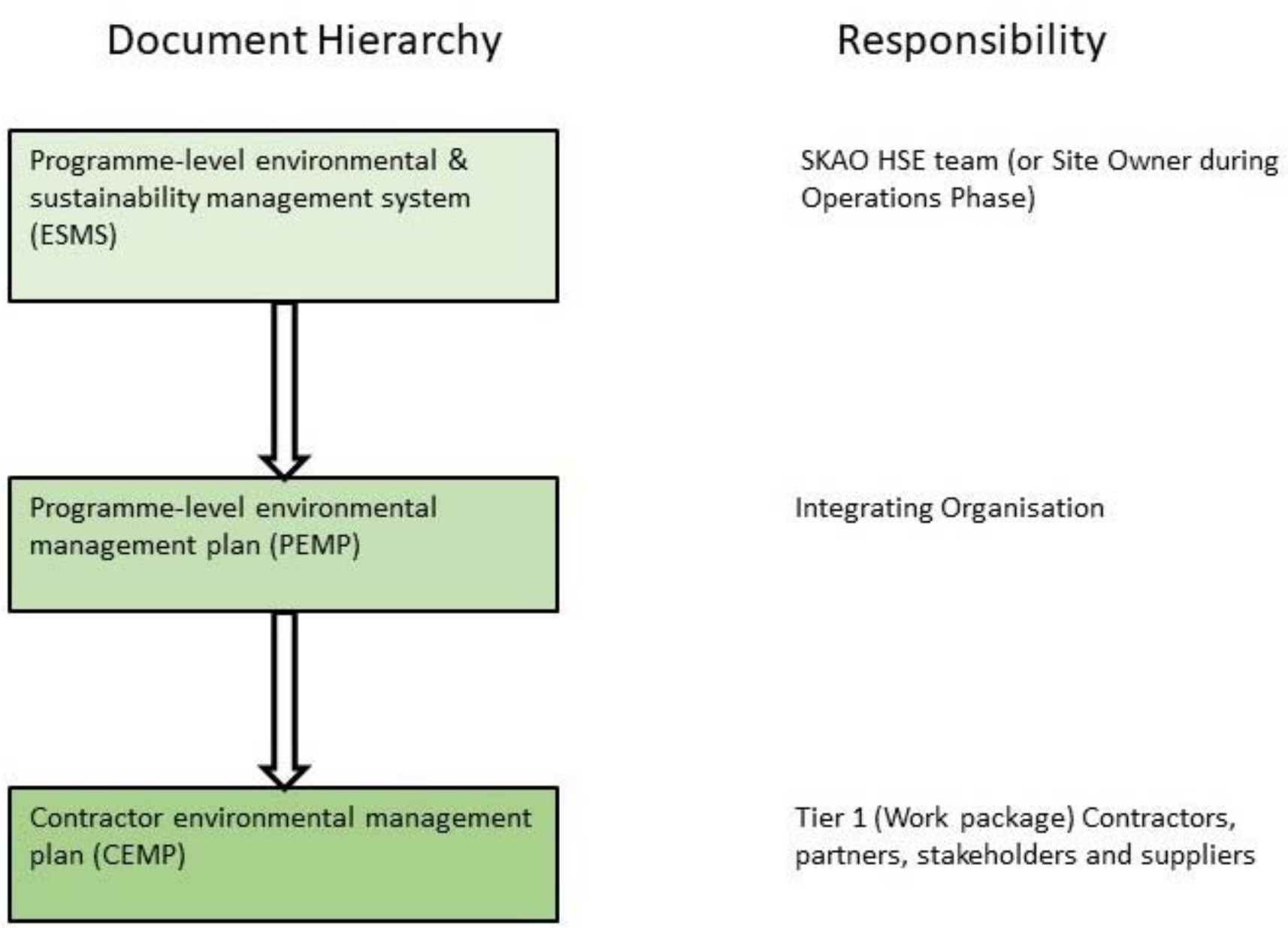


Figure 7: Document hierarchy and responsibilities for environmental management arrangements on SKA1 sites.

14.3 HSE Integrated Plans

Integrated HSE plans are welcome, but contractors may develop separate but mutually supportive H&S and Environmental Management Plans. For issues that have direct links between health & safety and environmental management, both aspects shall be considered in the plans. For example:

14.3.1 Noise and vibration

The regime for managing the noise and vibration emissions of plant and equipment to protect personnel from adverse effects shall be documented in the HSE plans so as to minimise noise nuisance, and shall be managed in accordance with all pertinent national legislation and standards.

14.3.2 Light

Artificial lighting, including temporary lighting to illuminate for the purposes of works, movement (people and vehicles), usage and security, shall be used striking an appropriate balance between adequate illumination for operational safety and security and also minimisation of light pollution, nuisance, distraction and energy use. External lighting should meet the requirements of all pertinent national legislation and standards. As part of regular and necessary maintenance luminance should be checked to take into account any wind disturbance.

14.4 Risk Assessments/System of Work and Method Statements

The supplier is required, for individual processes, to develop and maintain the overall HSE plans, to:

- Note hazards and risks advised by other suppliers including designers, any design coordinators and others.
- Identify all hazards, and evaluate significant risks associated with the work and site.
- Develop methods for dealing with those hazards (e.g. employing the hierarchy of elimination, substitution) with a focus on arrangements designed to protect all construction personnel, others who may be exposed and the environment.
- Document methods for risk control in the form of risk assessments and associated HSE plans and method statements.
- Develop and adopt method statements that address sequencing, work methodology and controls/precautions to protect site personnel, anyone else who may be affected and the environment.
- Maintain the risk assessments and associated HSE plans and method statements incorporating and communicating any changes required to reflect changes such as those in site conditions and work programme.
- Propose amendments to the hazard and risk register, through the Integrating Organisation and/or the Site Owner (during Operations Phase).
- Communicate the risk control arrangements to the supplier's own personnel, to the Site Owner (during Operations Phase), any design coordinators and others who may require this information for their own safety and security and to ensure efficient operations. Review training plans including toolbox talks with reference to risk control. Ensure that changes are communicated appropriately.
- Include a briefing on applicable method statements to all personnel at the point that they commence the work covered by each method statement, and provide update briefings if a method statement is amended.
- Throughout this process for developing and implementing risk management arrangements, to ensure effective liaison with any design coordinator and the active engagement of the integrated team.

SKAO assumes that suppliers will have a suitably competent design coordinator (or equivalent) available to advise on considerations of competence and resource in the management of health and safety risks.

14.5 Specific health & safety hazards

Construction phase health & safety hazards and risks are identified in Site Information documents [RD16] and [RD23- TBW]. The information in these documents is provided for summary guidance only.

Suppliers will also be provided with access to the SKA Hazard Safety Register (currently an Appendix within Safety in Design Compliance Report)

The supplier shall address the following issues, taking into account the information provided within the aforementioned documents and the Integrating Organisation HSE management system:

- project-wide issues including fire, site transport, slips, trips and falls, welfare facilities;
- health hazards including asbestos, noise, vibration, hazardous substances, musculoskeletal issues, leptospirosis, waste storage and handling, ionising and non-ionising radiation;
- safety issues such as fragile surfaces, temporary works, climactic conditions, plant and equipment;
- management issues including responses to accidents, incidents and emergencies, and personal protective equipment (PPE); and other initiatives.
- Leadership issues including behavioural programmes, safety tours and other initiatives.

The supplier shall develop best practice approaches to the health & safety hazards and risks identified, and wherever possible provide useful information on good practice and lessons learned to the Integrating Organisation to enhance the SKA1 HSE management system. Note that neither the health & safety hazard listing nor the guidance cited is exhaustive.

14.6 Specific environmental hazards and risks

Construction phase environmental hazards and risks are identified in Site Information documents [RD16] and [RD23 - TBW]. The information in these documents is provided for summary guidance only.

Suppliers will also be provided with access to the SKA Hazard Safety Register

The supplier shall refer to the appropriate and relevant regulations and formal guidance, and to the Integrating Organisation HSE management system which contain technical details and practical information on most common safety and environment construction hazards and issues.

The supplier shall develop best practice approaches to the environmental hazards and risks identified, and wherever possible provide useful information on good practice and lessons learned to the Integrating Organisation to enhance the SKA1 HSE management system. Note that neither the environmental hazard listing nor the guidance cited is exhaustive.

14.7 Procurement and supply chain management

The supplier is responsible for ensuring during their procurement process that the competence of sub-suppliers to address HSE matters is assessed, and only those capable of meeting the standard are appointed.
When appointing sub-suppliers, checks shall be made to ensure that the sub-supplier shall devote appropriate resource to meet the standard. During this process and after appointment, it is the responsibility of the supplier to ensure that sub-suppliers are aware of and understand the requirements of the standard as it applies to them, and to manage the relationship to achieve compliance, and to monitor and report performance.

14.8 Worker involvement

The SKAO is committed to encouraging positive engagement with the workforce on HSE. It recognises that in addition to meeting our legal obligations, effective consultation and engagement is a fundamental mechanism for achieving high standards of HSE. Each supplier is required to develop effective mechanisms for engaging their site personnel in the development and implementation of effective HSE policies and procedures. The Integrating Organisation is required to make appropriate arrangements, and to advise the SKAO, of worker engagement initiated on each of their projects based on the following:

- compliance with statutory requirements;
- construction personnel understanding that they are permitted to stop work if they feel at risk;
- advising personnel of the mechanisms for reporting health, safety and environmental issues within the supplier's team;
- taking no negative, critical action against any worker for raising a health, safety or environmental issue;
- ensuring that all personnel are addressed in a civil manner by all other personnel;
- include in every 'toolbox talk' an opportunity for personnel to ask questions and make comments;
- operating a consultation mechanism, and bringing this to the attention of all personnel in the Integrating Organisation controlled area;
- where applicable, establishing arrangements for the recognition of trades unions and their engagement at an appropriate representative level in forums for reviewing and developing health, safety and environmental arrangements;
- respecting appointment arrangements established amongst the personnel, specifically the appointment of safety representatives. The latter shall be afforded the normal rights to be directly involved, on behalf of their members, in all aspects of health and safety planning and implementation; and
- forwarding minutes of any formal consultation meetings held at project level to the Integrating Organisation, so that issues relevant beyond the project may be identified and addressed.

14.9 Monitoring and reporting

In addition to all accidents, incidents and hours worked being recorded and reported Integrating Organisations, design coordinators and lead designers shall be required to submit a monthly project health safety and environmental scorecard on specific inputs and controls in the areas of compliance, standards, behaviour and culture.
Additional sustainability metrics will be measured by other methods.

14.10 Audit and assurance

All contractors shall allow periodic inspections of their sites, offices, work and storage areas by SKAO HSE personnel and/or the Integrating Organisation in respect of fire precautions and other HSE provisions, and take any action as may be recommended.
Suppliers shall also cooperate with personnel to support Integrating Organisation audits required by audit schedule or in response to significant incidents or other reasons.

14.11 Emergency preparedness and response

All offices, projects and establishments shall have adequate emergency arrangements which are known to and readily available to those that may require them. This shall usually be in the form of the Fire and Emergency Plan developed by the Integrating Organisation.

Emergency planning and incident control – the HSE plans shall include the supplier's arrangements for dealing with reasonably foreseeable environmental contingencies, addressing:

- pollution incident recognition;
- notifications and reporting, including notification as soon as possible to the Integrating Organisation;
- arrangements to mitigate any incident, minimising harm arising; and

- recovery arrangements; and investigation, detailed report preparation and learning.
- The above arrangements shall take into account the project-wide incident management arrangements for responding to and reporting accidents and incidents

15 CONSTRUCTION SITE MANAGEMENT OF HSE

15.1 Access to site

The arrangements for access to any SKAO Site are subject to security standards. In liaison with the SKAO HSE team, the Integrating Organisation will specify security standards, including access controls, perimeter security requirements, and associated procedures. The Integrating Organisation is required to ensure compliance by all suppliers.

There is no conflict, rather mutual support, between site security and effective HSE management.

15.2 Site introduction

All personnel working on site (including members of the design, science or engineering teams) within the security zone of SKAO construction sites are required to have completed an SKAO construction site induction, provided by the Integrating Organisation.
Those working on other SKAO sites are required to be provided an equivalent induction (by SKAO or equivalent authorised, competent authority). Following this induction and compliance with security requirements, personnel will be issued with authority to access the SKAO construction site.
Identification and verification requirements are specified by the Integrating Organisation.
Note: This requirement also applies to all accompanied visitors.

15.3 Contractor inductions

The Integrating Organisation and the employing supplier shall cooperate in providing all personnel working under their control with an induction briefing which is specific to their works and the site location.

The Integrating Organisation shall maintain records on site to show that this has taken place. The records shall include:

- name;
- employee number (either related to the security reference that may be given or a unique reference to the contractor)
- signatures of attendees
- date of briefing;
- content of briefing, which shall include as a minimum:
- key members of the supplier's team;
- the SKAO commitment to HSE and the objectives;
- site details including layout and welfare facilities;
- communication, consultation, suggestion and fault reporting;
- appointed safety representatives and other trades union representatives (where appropriate) and environment representatives (where appointed);
- emergency procedures including action following an incident;
- details of the occupational health provision on site;
- restrictions including smoking, drugs and alcohol policies and permits to work.

Key messages conveyed in site induction shall be reinforced through site hazard boards, newsletters, videos, 'toolbox talks' and other means.

At the SKAO's discretion, visitors accompanied at all times by suitably competent supplier personnel, need not complete full supplier induction where: they are not undertaking any physical work; their presence on site is not interfering with any work; and their presence places neither themselves or others at any risk.

In addition to the general SKAO site and Integrating Organisation site-specific inductions all personnel shall be evaluated by the employing supplier as to their skill, knowledge and experience, so that they may be authorised by the supplier to carry out work that is within their competence. Such an evaluation shall also be used to identify further training needs and supervisory requirements and be logged in a training matrix or equivalent.

15.4 Visitors

When a site-based supplier hosts bona fide visitors, subject to the security controls in place, visitors shall be required as a minimum to:

- comply with the arrangements for obtaining a site visitor pass;
- attend a works orientation briefing (a shortened form of the supplier's induction briefing);

- be provided by the hosting supplier with appropriate PPE (indicating clearly the visitor status of the wearer), and advised in its necessary and correct use; and
- be accompanied at all times by a competent person, who is formally allocated responsibility for the visitor during normal working and also in the event of an emergency.

15.5 Drivers

Drivers delivering goods and materials, or removing materials and who shall remain during their visit within the cabs of their vehicles except to visit welfare facilities adjacent to parking areas, offices adjacent to parking areas to deal with paperwork shall receive briefings/induction at the discretion of the Integrating Organisation.

As a minimum, they shall be provided with a short briefing and a supporting document outlining their duties, site traffic control arrangements and related matters.

Drivers who are required to work on site outside of their cabs, for example to assist in sheeting up vehicles; and/or who shall operate their vehicles in construction operational areas, and not be restricted to designated site roadways and hard-standing/parking areas, loading bays and similar locations shall either be:

- holders of valid construction competency card and required to attend a full site induction or;
- be under appropriate supervision by the relevant Integrating Organisation at all times, and in any event be issued with the relevant security clearance in accordance with the SKAO and/or Integrating Organisation HSE team's requirements.

15.6 Supplier personnel

At every level supplier personnel – site personnel, supervisors, managers, auditors, advisers and others shall be competent to carry out their particular duties and tasks, or be adequately supervised if under training. It is the responsibility of the supplier to:

- ensure both specific task competence and also core health and safety competence for construction work through their organisation and their suppliers,
- to make use of suitable competency schemes (see Section 5, Appendix 2), and
- to maintain and promptly provide on request adequate records such that competence may be readily demonstrated.
- Supervisors and managers shall have practical and documented access to competent advice on health and safety matters
- The supplier shall make use of 'tool box' training to create and maintain high levels of HSE awareness, transfer information, advise personnel of changing circumstances and work progress and participate in supplier and site-wide campaigns. Such talks in a good environment, with a brief opportunity for questions and discussion, shall be conducted every week, and records kept of topics and personnel attendance.
- Arrangements for personnel shall reflect current good practice for the management of stress, and may include application current industry best practice so that psycho-social issues are addressed to minimise harm, absence and other possible adverse outcomes.

15.7 Supervision

The supplier shall ensure that work is adequately supervised at all times by competent persons. The arrangements shall specifically address the supervision of new-to-site personnel, young persons, pregnant women and other personnel at risk. The arrangements shall also include those for addressing foreseeable emergencies.
The supervisory arrangements shall also be reviewed in advance, with SKAO and Integrating Organisation HSE teams, for adequacy and suitability in the unlikely event that with any lone or isolated work is anticipated.

15.8 Inspections

The supplier shall ensure that work sites, work areas and projects shall be subject to routine inspections by competent persons.

Each work area shall be subject to inspection during each working period/shift addressing work set-up, housekeeping and work practices, and suitable, simple and non-bureaucratic records shall be kept.

The supplier shall cooperate with inspections by representatives of the SKAO, Integrating Organisations and other properly authorised persons including those belonging to relevant governmental organisations.

15.9 General behaviour

The supplier shall ensure, through its policies, training and supervision that all personnel are aware of basic requirements including:

- respect for good site practice and avoidance of horseplay;
- prohibition on urination other than in provided toilets; and
- respect for other people, including no use of foul, abusive or racist language, no aggressive or violent behaviour, harassment or bullying

The supplier shall have explicit policy statements on good site practice, horseplay, harassment and bullying. Such policies shall be supported by a complaints procedure accessible to all employees.

15.10 Alcohol and drugs

There is a strict alcohol and drugs policy that applies to persons working on the SKAO Site and in connection with the Integrating Organisation operations. The details of this policy are administered by Integrating Organisation.

No alcohol or drugs shall be consumed by supplier personnel within the site boundaries of any SKAO work site.

Persons suspected of being under the influence of alcohol and/or drugs shall be refused entry to site or required to leave site and shall be subject to testing by the Integrating Organisation. The supply of illegal drugs by supplier personnel within the site boundaries of any SKAO work site is also prohibited. All supplier personnel who are safety critical and are under any form of prescription medication shall advise the Integrating Organisation without delay.

A detailed alcohol and drugs policy is provided in Appendix 11).

-

The supplier is required to bring this policy to the attention of their personnel and ensure compliance. Non-compliance shall result in the exclusion of the person(s) concerned.

Repeated non-compliance shall lead to the supplier/employer's exclusion from the SKAO sites.

15.11 Smoking

Smoking on the SKAO work sites is prohibited, except in specific, designated locations which shall exclude all enclosed work areas including offices and welfare facilities.

Smoking facilities shall be managed to minimise any fire risk, and to avoid creating discomfort or health risk to other personnel and as a minimum represent compliance with any legal requirement to protect people from passive smoking.

15.12 Personal telephones, radios and audio equipment

Use of personal mobile telephones, radios, laptops and computers and portable audio equipment are prohibited on SKA1 construction work sites.

Personnel are expected to turn off Wi-Fi and Bluetooth capability on all devices and lock cars using manual locking mechanisms.

Telephones should only be used in circumstances proscribed in local EMC plans and which comply with [AD5] SKA EMI/EMC Standards & Procedures, SKA-TEL-SKO-0000202.

Please also note that the use of radio equipment in any genuine emergency is permitted anywhere on site.

15.13 Communications – Oral and Written English

The supplier shall ensure that all personnel fully understand the site HSE requirements as expressed orally and in written signage, including emergency arrangements. The language needs of personnel shall be addressed by suppliers during induction, and through training.

Emphasis should be placed on ensuring proper supervision of all staff, but in particular those who may have difficulties in understanding verbal or written communications.

Where practicable, site signage shall make maximum use of pictograms.

Those who have responsibility for managing the supplier personnel on site shall be able to communicate in both written and oral English to a standard appropriate to the tasks being performed.

Note that there may be personnel who are not competent in the English language, and this is permitted provided that the supplier can demonstrate that:

- such team members are able to give oral instructions and warnings to others;
- such team members shall receive the required health, safety and environmental training / briefing (including any emergency procedures) before commencing work in a form that they understand; and
- the supplier shall make appropriate arrangements to ensure that instructions are effectively communicated to, and understood by all team members.

Particular attention shall be made to the communication requirements of safety critical workers.

15.14 Control of Hours Worked

15.14.1 Working Time Regulations

Suppliers shall comply with any and all statutory Working Time Regulations (e.g. Australian Fair Work Act or South African Basic Conditions of Employment Act).

Where the supplier has a written opt out agreement with its employees, which shall be obtained without exerting pressure on individuals, this shall be notified to the SKAO and Integrating Organisation.

In calculating the numbers of hours worked by personnel, the supplier shall take fully into account those hours worked for any other supplier. Where the working day is known to include significant travelling time, this should also be taken into account. The supplier shall maintain records of employees' working hours and these shall be made available to the Integrating Organisation or an appointed auditor, immediately upon request, for monitoring and audit purposes.

Hours of work shall also be controlled vis-à-vis environmental controls, respecting limitations imposed by any statutory authorities and normal good practice, and the SKAO requirements to minimise neighbour nuisance.

15.15 Removal of Suppliers personnel from site

Suppliers shall take appropriate actions to prevent and eliminate unacceptable behaviour or conduct. The SKAO, Integrating Organisation and their nominated representatives reserve the right to object to and (where appropriate) immediately expel any of the supplier's personnel or sub-contractors employed on the works from site and to prohibit entry/re-entry of personnel.

Such action will normally only be taken in serious cases, and as far as practicable shall be subject to consultation between the SKAO, the Integrating Organisation and the contractor / supplier.

15.16 Monitoring, Auditing, Investigations

The emphasis throughout the works shall be on suppliers conducting their own monitoring, auditing and investigations and providing assurance that the information so generated is valid and verifiable.

Suppliers and their personnel shall also cooperate fully with any monitoring, audits or specific investigations carried out by suppliers above them in the supply chain, by the Integrating Organisation or its representatives and by the SKAO and its representatives.

Such HSE assurance activities will be conducted in order to maintain and improve HSE performance. The techniques to be employed may include, but not be limited to:

- site HSE inspections;
- HSE audits;
- Any subsequent Corrective Action Requests (or reasonable equivalents).

15.17 Transport

15.17.1 Construction Transport Management Plan

Contractors and suppliers shall ensure that they comply with the Integrating Organisation Construction Phase Health and Safety Plan and any Construction Transport Management Plan for the SKAO sites primary routes and common areas as defined by the SKAO.

The site design and arrangements shall include suitable provisions for segregation of pedestrians and mobile plant and vehicles, procedures for reversing activities and similar aspects to prevent accidents. The Integrating Organisation Construction Phase Health and Safety Plan must incorporate guidance on common standards to be maintained at vehicle/pedestrian boundaries including designated crossing points. In general, compliance is required with the statutory national standards.

This shall be reinforced by the use of suitable barriers, signage and briefings and participation in campaigns as specified by the SKAO and Integrating Organisation team.

A suitable speed limit for the primary routes will be set and enforced by the Integrating Organisation.

Contractors and suppliers shall comply and take steps to ensure compliance from sub-contractors.

16 INTEGRATION & VERIFICATION / ENGINEERING COMMISSIONING

The term Commissioning can be interpreted in a variety of ways on the SKA1 project. For the purposes of this HSE Plan "Engineering Commissioning" refers to those activities predominantly undertaken in the final stages of construction, prior to ultimate transition and handover to an Operations team.

This is a phase of the project will require particular care and due attention to health & safety as unproven works are activated, tested, integrated and verified at a system level

For the purposes of HSE Plan the term “Science Commissioning” refers to post-handover activities. In traditional engineering language Science Commissioning may be deemed synonymous with optimisation of system or systems after they have been proven safe to operate.

Distinct groups, responsible for acceptance, integration, engineering commissioning and routine operations, respectively, will be assembled for construction and the transition to steady-state operations. Acceptance, Integration, Verification and Engineering Commissioning will be the responsibility of the SKA Construction Project.

Science Verification of the telescope system will the responsibility of Operations scientists working within the Construction project and supported by the Commissioning and AIV teams.

Routine Operations will be the responsibility of SKA Operations within the host countries.

Acceptance procedures will be followed for all deliverables: HSE evaluation according to terms of contract will be the responsibility of the Construction Project.

The HSE planning for systems integration, verification and commissioning, including HSE acceptance procedures is discussed (and will be developed further) under:

- SKA-TEL-SKO-0001201 SKA1 Project Engineering Management Plan
- SKA-TEL-SKO-0001350 SKA1 Commissioning and Science Verification Plan
- Integration and Verification Plan for SKA1_LOW, SKA-TEL-AIV-4430001-SE-DIVP-PLN
- Integration and Verification Plan for SKA1_MID, SKA-TEL-AIV-2430001-SE-DIVP-PLN

17 HEALTH, SAFETY AND ENVIRONMENTAL CULTURE

HSE culture can be defined as the way in which HSE is managed in a workplace. It is the combination of beliefs, perceptions and attitudes of staff toward the safety of workers and the overall environment of workplaces. Cultivating a strong and vibrant HSE culture is a key aspect in maintaining workplace safety.

A positive HSE culture is the culture of a workplace in which all staff, contractors, suppliers and partners think of HSE as an important thing and behave in a way that prioritizes their own safety as well as the safety of those around them. This includes using proper personal equipment, following HSE laws and just generally being conscious of HSE and safe practices at all times.

17.1 Leadership and commitment

A strong HSE culture is recognised as making a vital contribution to achieving excellent performance, requiring action by the SKAO and every supplier.

Health and safety starts at the top. As the workplace leader, SKAO leaders and management, staff, partners and suppliers must demonstrate that we take health, safety and environmental issues seriously.

Strong leadership and a firm commitment to continuously improving HSE performance, backed by action, are the foundations of a strong HSE culture.

The SKAO will show we are committed to making sure workers stay safe on the job by embedding health, safety and environmental in every aspect of the workplace.

We will demonstrate health, safety and environmental leadership in many different ways, such as:

- Driving annual health and safety plans forward with our management teams
- Visibly focusing on health and safety on the “shop floor”
- Making health and safety a topic of everyday conversation
- Regularly leadership visits to worksite(s) to champion the safety agenda
- Setting clear expectations and encouraging accountability
- Measuring outcomes of HSE activities
- Promoting the investigation of near misses
- Training and investing in all areas of health and safety
- Being honest and open about HSE issues
- Striving to continually raise the profile of health and safety
- Sharing and promoting our SKAO HSE Policy and Plan

In creating a workplace culture that values health, safety and environmental standards, we will be transparent about the importance of HSE across the workplace. Engaging our staff, partners and suppliers appropriately in all aspects of HSE, including planning, implementation, and day-to-day activities, will help with this transparency.

All of our leaders and managers are positively encouraged and empowered to ask questions and challenge individuals and organisations on the topics above will help drive health, safety and environmental improvement.

17.2 Continual Improvement

SKAO staff, the Integrating Organisation, Tier 1 Work Package Contractors, other contractors and design co-ordinators across all projects undertaken leaders and management, staff, partners and suppliers shall promote a positive occupational health, safety and environmental culture.

This may be conducted in a number of ways, including, but not limited to, the **Plan-Do-Check-Act (PDCA) concept** methodology articulated in section 4.4 of this document.
Plan: Identify an opportunity and plan for change.
Do: Implement the change on a small scale.
Check: Use data to analyse the results of the change and determine whether it made a difference.
Act: If the change was successful, implement it on a wider scale and continuously assess your results. If the change did not work, begin the cycle again.

Other examples may include:

- the encouragement of near miss reporting,
- the use by suppliers of safety climate tools and other employee satisfaction measures,
- behavioural safety and environmental management programmes,
- benchmarking,
- recognition,
- incentives and
- other proportionate mechanisms

to create, embed and sustain an effective HSE culture.

17.3 Monitoring

In addition to all accidents, incidents and hours worked being recorded and reported the Integrating Organisation, Design coordinators and lead designers on SKA1 shall be required to submit a monthly project health safety and environmental scorecard on specific inputs and controls in the areas of compliance, standards, behaviour and culture.

The SKAO favour a proactive HSE management approach. It's almost always cheaper in the long run, and of course, it's better to prevent an accident before it happens than wait for one to happen.

Examples of HSE measures for the SKA1 project are provided in Appendix 3 Health, Safety and Environmental aims and indicators. (Specific metrics will be developed prior to commencement of SKA1 construction and will be included in further revisions of this HSE Plan).

17.3.1 Proactive HSE measures

Proactive HSE management is all about keeping ahead of the game, resolving any issues before an incident or an accident occurs.
This may include, but not be limited to:

- Inspections
- Interviewing
- Audits
- Monitoring performance
- Monitoring behaviour
- Checking procedures
- Health, Safety and environmental sampling

In the short term, proactive safety measures can seem more expensive. Organisations are putting in place (and spending money) on HSE before any issues may have developed.
Proactive HSE inspections, regular auditing, ongoing training, near-miss reporting and active supervision will all form part of a proactive safety management structure.
The benefits of a proactive HSE regime are that it will enforce a positive HSE culture, help to prevent accidents from occurring, and improve health, safety & environmental budgeting.

17.3.2 Reactive HSE measures

Reactive HSE management is about dealing with issues, accidents and incidents when, or after, they occur. Unlike proactive HSE management, it's too late to stop them. Reactive HSE measures are about putting things right.
Reactive HSE measures include:

- Accident reporting

- Accident investigation
- Incident investigation
- Ill health and sickness reviews
- Identifying trends

With reactive HSE measures, you are taking action after things have gone wrong. This often means that there is more pressure to take action quickly so that work can re-commence and people can be assured that there is no risk of reoccurrence.
There may also be external pressure from insurance companies, clients, and the statutory authorities if the incident is serious.
In the long term, reactive HSE measures tend to be more costly, because of the need to put in place many of the same things that could have been done before an accident/incident occurred, plus having the extra expense and costs associated with an accident/incident.

17.4 Celebrating Success

SKAO leaders and management, staff, partners and suppliers should, at every opportunity, make HSE efforts and initiatives public to keep everyone motivated and updated throughout the process.

Giving praise and recognising when someone has done a good job doesn't come naturally to some people. Many organisations gauge how good or bad their HSE performance is by the number of accidents they have had compared to their competitors or against their performance last year. While there is a place for such reactive measures of success or failure there are other levers we can pull to improve HSE related operations.

There is a body of research that suggests changing focus to being more positive can have an effect on people's performance, and those organisations and professionals that have already embraced this are reaping the rewards through more sustainable advances to their HSE performance and culture.

One does not need a full blown behavioural HSE programme to change from focusing on the negative to celebrating safety as well. By way of example the following six simple things that are known to work:

17.4.1 Giving feedback

It makes sense to encourage line managers and peers to give feedback on how people are working. This is more than just saying "thank you for working safely" as doing so might sound a little condescending.

If line managers are not used to giving feedback to their people, help them by providing a framework:

- Observe: watch what is going on and then give the person the feedback, straight away if possible, as feedback is more powerful when it is done in the moment.
- Open: start the conversation. This is often the hardest part, but having done it a few times the manager's confidence will grow.
- Exchange: give the person the feedback, either positive or developmental.
- Commit: agree what actions you want to happen as a result of the conversation.
- Conclude: draw the conversation to a close.

17.4.2 Letters from leaders and managers

When team members view their work as exciting and challenging and are recognized for their hard work, they're more likely to become inspired to do great work. Failing to provide a workplace environment of appreciation and recognition can have negative consequences on employee engagement.

The power of recognition should not be underestimated. Some organisations have a system where someone's good work is flagged up to their line manager or director and they then write them a letter recognising their contribution.

If such a process doesn't exist setting one up is straightforward, e.g. encouraging the line managers and supervisors to drop their senior leaders an email when they think a colleague has gone out of their way to do something to really improve the working environment, or took a brave decision to ensure the safety of their colleagues.

One of the most effective ways to cultivate loyalty and engage employees in their work is by building a culture of appreciation. This, in turn, will have an effect on productivity.

17.4.3 Newsletters

Most organisations have some form of newsletter, whether it is a hardcopy or electronic format. These are ideal publications to celebrate HSE successes, although the type of piece usually needs to be meatier than reminding staff to wear the right PPE or fill in the correct form.

When team members see that their work is having a direct impact on the success of a company, it motivates them to contribute their best work. Celebrating workplace milestones shows staff and colleagues that, not only are they a valued and honoured member of the team, but they are also contributing meaningful work to their organisation and its purpose.

For those not being recognized, sharing in the success of their teammates and seeing that hard work does not go unnoticed can help further your culture of appreciation and motivate the entirety of the team.

If an HSE story got in your newsletter, not only would it be a great way to celebrate the person working safely, but it would also remind others that they might be next and that they are ambassadors for the organisation and to question whether they are working safely when they're away from the work.

17.4.4 Taking ideas forward

Lots of people have ideas to improve health, safety and the environment; such ideas come from all directions, for example, from competitions, safety committees and safety tours. If it is decided to take an idea forward, keep the person who came up with it involved throughout, and when 'it' is launched publicise that it was their idea.

17.4.5 Workforce heroes

All the ways to celebrate HSE success outlined so far help to identify workforce heroes. These are people who are respected, recognised and trusted by the workforce.

The important thing is to say thank you and well done to these workforce heroes and use their position with their colleagues to encourage them to follow suit.

What we are you're saying is: you have the respect of your colleagues and managers, you're recognised for working safely and doing a good job and people trust you.

17.4.6 Formalised award programme

If developing formalised safety awards programme, there are structures in place that many safety bodies use that are good to follow.

Decide on the criteria that you want to recognise, publicise it throughout your organisation, and get a judging panel together to review all the entries. The awards themselves might just be a certificate in a frame, but you can make it a 'big thing' by inviting the winners and their partners to an evening event where they have to dress up, go to a nice hotel or restaurant, have their picture taken by a professional photographer and have a meal with the other award winners before receiving their award from one of the organisation's senior leaders.

While front line workers might be a little reluctant to go to these sorts of events at first, experience shows that when they get there, both they and their partners feel proud of their achievements. Many organisations have an awards evening or annual conference so adapt the idea and use these events as the celebration.

Conclusion

Every day people work safely and, in lots of cases, every day their efforts go unnoticed, yet recognising the right behaviour is really important. We (leaders, managers, HSE professionals, academia and industry in general) don't do it enough and we should. It doesn't have to be expensive and often it is the little things that mean so much.

Appendix 1: SKAO Health, Safety and Environmental Policy Statement

1 Health, Safety and Environmental Policy

The Board of Directors of SKA Organisation ("SKAO") and the Director-General are fully committed to ensuring high standards of health, safety and environmental management throughout our operations and believe that the SKAO's goals cannot be achieved without such standards

1.1 Purpose

To create, through the decisions, plans and actions of all staff, Industry Partners, Stakeholders, Consultants and Contractors, a culture and work environment that ensures everyone associated with the SKA project goes home unharmed every day.

We will ensure our operations are conducted in accordance with local environmental standards and legislation and seek to improve the environmental impact of our operations where economically practical to do so.

1.2 Principles

Health and Safety is a central responsibility of all those working throughout the SKA project.

Good health and safety management is critical to the success of SKAO and will be achieved through compliance with the Health and Safety aspects of this Policy by:

- Demonstrating the strategic importance of Health & Safety through the visible leadership of the Director-General and the SKAO Board;
- Providing effective Health & Safety leadership throughout SKAO in order to promote a positive and just Health & Safety culture and engage management and workforces in decisions that affect their Health & Safety;
- Aiming for Health & Safety excellence in our own activities and promoting exemplary Health & Safety performance from consultants and contractors;
- Setting standards for Occupational Health and Wellbeing performance that reduce risks to health and that promote a healthy working environment;
- Continually seeking to further improve our Health & Safety performance in order to support the SKA project's objectives and to fulfil our obligations as a responsible employer;
- Setting progressive objectives and targets to improve Health and Safety management and performance in keeping with stakeholder expectations;
- Considering any material Health & Safety implications arising from the introduction of new processes, working practices and personnel;
- Providing proactive management and assurance of Health & Safety in design, construction and operational activities;
- Ensuring that Health & Safety is a regular agenda item for Board meetings during which Health & Safety performance will be reviewed, and decisions taken upon appropriate actions, to address any weaknesses identified;
- Appraising the performance of our senior managers in a manner which includes an assessment of their contribution to Health & Safety performance;

- Continually assessing the competency of our staff, provide and support appropriate training and professional development;
- Providing competent Health & Safety advice and ensuring that procedures are in place to implement any new legal and SKAO requirements; and
- Ensuring that adequate resources are provided to deliver these commitments and taking Board decisions which are consistent with them.

We will use the following general principles to inform SKAO environmental objectives and plans:

- Increase awareness of our environmental impact amongst our employees, facility users, tenants and contractors;
- Monitor our consumption of primary raw materials (water, energy etc.) and implement the principles of reduction, reuse and recycling across all its activities to minimise, within the constraints set by our scientific programme, the waste and CO2 emissions produced as a result of our activities;
- Ensure environmental performance of prospective suppliers is considered in the procurement processes;
- Encourage the use of modes of transport by staff, contractors and users that minimise environmental impact, promoting the use of technologies that eliminate the need for travel; and
- Develop and maintain our buildings in an environmentally sustainable manner, seeking to protect natural habitats and local wildlife, minimising light pollution and preserving biodiversity in partnership with local communities.

1.3 Applicability, Implementation & Resources

This policy applies to all aspects of the SKAO project.

Implementation within the SKAO being through the SKA Project Execution Plan while implementation by suppliers and industry partners is achieved through contracts and agreements developed by the SKAO in accordance with the Construction and Operations Plans.

The SKAO senior leadership team will ensure the availability of resources needed to implement this policy and ensure that it remains effective and relevant through regular reviews and updates.

This policy will be reviewed annually and communicated to all employees, users and stakeholders.

Philip Diamond 2019-09-06

Director General Date

Appendix 2 - Core criteria for demonstration of competence

How to assess competence of Organisations

Organisations who are bidding for work or those appointed through contributed in-kind effort should put together a package of information that shows how their own policy, organisation and arrangements meet these standards. If regularly updated, this information should then be used each time they are asked to demonstrate competence as part of a tender or appointment process.

As referenced in Section 13.2. pre-qualification is carried out according to a standard including a safety questionnaire.

Alternatively, organisations may use an independent accreditation organisation to assess their competence against the elements of the core criteria. Where this route is adopted, both SKAO and organisations putting themselves forward for assessment should satisfy themselves that the accreditation body is using the criteria in Appendix 2 as a basis for the assessment, and that the assessment process is robust enough to give the assurance necessary to ensure compliance.

Small companies may not have a written health and safety policy, organisation and arrangements, but they do need to demonstrate that their policy, organisation and arrangements are adequate in relation to the type of work they do. This could be done through an oral briefing, but assessments of competence will be made easier if procedures are clear and accessible. For small companies the assessment should be simple and straightforward, and they should be able to show that they meet the criteria without the need for extensive paperwork.

Where the work is much larger than any that the organisation being assessed has worked on before, or where the work will involve them managing new risks, this should not automatically rule them out for consideration for the work. The assessor should look for an appreciation of these risks; an understanding of how they will be managed, and some indication of how any shortcomings in their current arrangements for managing such risks will be addressed.

It may be that an organisation is weak in certain areas. This can be addressed by putting arrangements in place to cover these weaknesses, or by employing people with particular expertise for relevant parts of the contract. What really matters is that the organisation has access to the expertise which it needs, and the ability to control the risks which arise from the work.

Note that assessments should focus on the needs of the particular project and be proportionate to the risks, size and complexity of the work. Unnecessary bureaucracy associated with competency assessment can obscure the real issues and divert effort away from them.

How to assess the competence of individuals

The information in this section will help SKAO managers, scientists, engineers or others who control the way in which design and/or construction work is carried out to assess the competence of key individuals. When assessing the competence of an organisation or company using the core criteria in Appendix 2, Stage 2 requires an assessment of individuals' qualifications and experience. The advice given in this section should be used to carry out such assessments.

Note that assessments should focus on the needs of the particular job and should be proportionate to the risks arising from the work.

As with organisations, assessing the competence of an individual should be a two-stage process:

(a) Stage 1: An assessment of the person's task knowledge to determine whether this is sufficient to enable them to carry out the work safely and without risk to health;

(b) Stage 2: An assessment of the individual's experience and track record to establish that they are capable of doing the work; they recognise their limitations and how these should be overcome and they appreciate the risks from doing the work and how these should be controlled.

Stage 1 assessments will look at an individual's qualifications and training records, and arrangements which have been made for their Continuing Professional Development or lifelong learning. This will include an assessment as to whether the individual has a basic understanding of the hazards and risks arising from design and/or construction work which is essential for all people who work on or regularly visit sites.

Stage 2 assessments should concentrate on the person's past experience in the type of work which they are being asked to do.

Where the work is more complex than any that the person has done before, or where the work will expose them to new risks, this should not automatically rule them out for consideration for the work. In these circumstances, the assessor should look for an appreciation of these risks; an understanding of how they will be managed, and some indication of how any shortcomings in their current knowledge will be addressed. Working under the supervision of someone who is competent and familiar with the work is one way in which people can learn how to do work safely.

Assessing an individual's basic understanding of design and site risks

A basic understanding of the general risks arising from design and/or construction work is essential underpinning knowledge for everyone who works in the industry in order that they can protect their own health and safety and understand the effect that their own actions could have on others. This is particularly important for those who will regularly visit or work on construction sites. This basic understanding should be the foundation for health and safety knowledge and understanding on which more detailed competencies are developed.

Those who are new to construction work will need close supervision by an experienced person until they can demonstrate that they are aware of these risks and know how to avoid harm.

Assessing the competence of individual designers and system engineers
When carrying out an assessment for managers, scientists, engineers or others, membership of a relevant design or construction-related professional institution gives a strong indication that the person has the necessary task knowledge and experience needed to fulfil the role. Some institutions have different levels of membership which may give a clearer indication of the knowledge which they possess. Fellowship of an institution generally indicates that a member has more in-depth knowledge and experience of a subject than that held by an ordinary member.

Competence of individual designers
Membership of a relevant professional institution is a strong indicator that a designer has the necessary task knowledge and an ability to recognise the health and safety implications of their design work. Membership of a relevant register administered by such an institution gives a more detailed indication that the designer has the necessary knowledge and experience.

Those who specify materials, equipment and standards of finish (for example interior designers) are also considered designers, but they tend not to be members of specific professional institutions. Relevant academic qualifications or evidence of their past experience in this type of work will give a strong indicator as to their competence.

Those who only occasionally become involved with design work and who do not meet the qualifying criteria (for example trainees) should work under the supervision of a competent designer.

When carrying out Stage 2 of the assessment organisations should consider the designer's past experience in the type of work which they are being asked to do. Those without relevant experience should be allowed to work under the supervision of someone who has it. If designers work as part of a team, different individuals may bring different skills and knowledge to the work, and this should be taken into account when making the assessment.

Assessing the competence of individual managers, scientists, engineers (or others)
Managers, scientists, engineers or others need good interpersonal skills in order to encourage co-operation between designers and others. Although the SKAO require everyone to co-operate with all involved in the project, managers, scientists and engineers have a specific duty to ensure that co-operation happens. Without it, good working relationships, clear communication and sharing of relevant information will not happen. An over-bureaucratic approach should be avoided, not least because it makes it harder to secure the co-operation which is needed.

Managers, scientists and engineers also need a sound understanding of:
(a) health and safety in design and/or construction work;
(b) the design process;
(c) the importance of co-ordination of the design process, and an ability to identify information which others will need to know about the design in order to carry out their work safely.

This knowledge needs to be relevant to the project and future maintenance, use, refurbishment or demolition of the structure. The size and complexity of the project will determine whether an individual is capable, and has the resources to carry out all of the work required.

Managers, scientists and engineers are not necessarily designers, and do not have to undertake any design work themselves. But in order to assess the health and safety implications of the design, they must have sufficient knowledge of the design process to enable them to hold meaningful discussions with designers, recognise when information about risks arising from the design will need to be passed to others and participate fully in relevant design team meetings.

When carrying out the assessment, leadership and management will need to take into account the size and complexity of the project, and the nature of the risks which will be associated with it. Where one individual does not possess all of the skills and experience necessary, the work can be shared with others, but it must be clear who is responsible for each part of the work, and who is in overall control.

For small projects where there are no special risks, Stage 1 of the assessment should concentrate on the person's knowledge of the construction processes and the health and safety risks associated with the work. An appropriate health and safety qualification will demonstrate that the person has adequate knowledge of health and safety, but this will need to be coupled with a Stage 2 assessment to demonstrate that they have experience in applying this knowledge in the construction environment.

For larger or more complex projects, or for those with unusual or higher risks, the skills and knowledge of a managers, scientists or engineers will need to reflect the complexity of the project and the specialist knowledge necessary to ensure that risks are properly controlled. It is more likely in these circumstances that a corporate appointment will be made and the competence assessment will be made against the core criteria. The table in Appendix 2 gives further guidance on the standards to be achieved for system engineers appointed to this type of project.

Managers, scientists, engineers and others cannot carry out their duties effectively without the support from employer leaders. For that reason they will often need an understanding of relevant aspects of the business and the implications of the proposed work for it. Managers, scientists, engineers and others will need to make sure that employers understand their own role and duties as well as the benefits of good management of the project and early appointment of duty-holders.

All designers, contractors and other team members that organisations and partners, stakeholders or suppliers propose to engage must be competent (or work under the supervision of a competent person), adequately resourced and appointed early enough for the work they have to do

Appointed in-kind organisations, companies, contractors, engineers and designers

Organisations and companies need to meet the standards set out in the core criteria table in Appendix 2. Column 1 of the table lists the elements which should be assessed when establishing whether or not a company is competent for the work which it will be expected to do. Column 2 lists the standards against which the assessment should be made. Column 3 gives some examples of how a company might demonstrate that it meets these standards.

Companies do not have to produce all of the evidence listed in Column 3 to satisfy the standard - they simply need to produce enough evidence to show that they meet the standard in Column 2, taking account of the nature of the project and the risks which the work entails. This requires Companies to make a judgement as to whether the evidence provided meets the standard to be achieved. If the judgement is reasonable, and clearly based on the evidence asked for and been provided with, Companies will not be criticised if the subsequently appointed organisation or individual proves not to be competent when carrying out the work.

Remember that assessments should focus on the needs of the particular job and should be proportionate to the risks arising from the work. Unnecessary bureaucracy associated with competency assessment obscures the real issues and diverts effort away from them.

If Companies employ less than five persons they do not have to write down their policy, organisation or arrangements under criteria 1 and 2. However, they do need to demonstrate that their policy and arrangements are adequate in relation to the type of work done. Assessments of competence will be made easier if procedures are clear and accessible.
'Contractor', 'Designer' and 'Engineer' relate to their function, not to the type of organisation.

	Criteria	*Standard to be achieved*	*Examples of the evidence that could be used to demonstrate the required standard is met*
	Stage 1 assessment		
1	Health and safety policy and organisation for health and safety	Organisations are expected to have and implement an appropriate policy, regularly reviewed and signed off by the Managing Director or equivalent. The policy must be relevant to the nature and scale of work and set out the responsibilities for health and safety management at all levels within the organisation.	A signed, current copy of the company policy (indicating when it was last reviewed and by whose authority it is published).
2	Arrangements	These should set out the arrangements for health and safety management within the organisation and should be relevant to the nature and scale of work undertaken. They should set out how the company will discharge their duties under relevant national law. There should be a clear indication of how these arrangements are communicated to the workforce.	A clear explanation of the arrangements which the company has made for putting its policy into effect and for discharging its duties under relevant national law. Guidance on making arrangements for the management of health and safety can be found in [RD2] ISO 45001.
3	Competent advice – corporate and construction related	The organisation and their employees must have ready access to competent health and safety advice, preferably from within the organisation. The advisor must be able to provide general health and safety advice, and also (from the same source or elsewhere) advice relating to design, construction and operational health and safety issues.	Name and competency details of the source of advice, for example a safety group, trade federation, or consultant who provides health and safety information and advice. An example from the last 12 months of advice given and action taken.
4	Training and information	Organisations should have in place, and implement, training arrangements to ensure their employees have the skills and understanding necessary to discharge their duties as contractors, designers or system engineers. They should have in place a programme for refresher training, for example, a Continuing Professional Development (CPD) programme or life-long learning which will keep their employees updated on new developments and changes to legislation or good health and safety practice. This applies throughout the organisation – from Board or equivalent, to trainees.	Headline training records. Evidence of a health and safety training culture including records, certificates of attendance and adequate health and safety induction training for site-based workforce. Evidence of an active CPD programme. Sample 'Toolbox talks'

5	Individual qualifications and experience	Employees are expected to have the appropriate qualifications and experience for the assigned tasks, unless they are under controlled and competent supervision.	Details of qualifications and/or experience of specific corporate post holders for example Board members, health and safety advisor etc. Other key roles should be named or identified and details of relevant qualifications and experience provided. **For contractors:** details of number/percentage of people engaged in the project who have passed a construction health and safety assessment, for example the Australian Worksafe WA OHS Construction Induction or similar national scheme equivalent. **For site managers**: details of any specific training such as the UK Construction Skills CITB 'Site Management Safety Training Scheme' certificate or similar national scheme equivalent. **For site workers:** details of any relevant qualifications or training such as S/NVQ certificates or similar national scheme equivalent. Evidence of a company-based training programme suitable for the work to be carried out. **For design organisations:** details of number/percentage of people engaged in the project who have passed a construction health and safety assessment, for example the UK CITB Construction Skills touch screen test or affiliated schemes or similar national scheme equivalent. Details of any relevant qualifications and/or professional institution membership and any other specific qualifications such as Chartered Member of SAIOSH (South African Institute of Occupational Safety and Health) or similar national scheme equivalent. **For Construction managers and engineers:** details of number/percentage of people engaged in the project who have passed a construction health and safety assessment, for example the UK CITB Construction Skills touch screen test or affiliated schemes, or the CCNSG equivalent. Evidence of health and safety knowledge such as UK NEBOSH Construction Certificate or similar national scheme equivalent.

6	Monitoring, audit and review	Organisations should have a system for monitoring their procedures, for auditing them at periodic intervals, and for reviewing them on an ongoing basis.	Could be though formal audit or discussions/reports to senior managers. Evidence of recent monitoring and management response. Copies of site inspection reports.
7	Workforce involvement	The organisation should have, and implement, an established means of consulting with their workforce on health and safety matters.	Evidence showing how consultation is carried out. Records of health and safety committees. Names of appointed safety representatives (trade union or other). For those employing less than five, be able to describe how they consult with their employees to achieve the consultation required.
8	Accident reporting and enforcement action; follow-up investigation	Organisations should have records of all reportable events (under applicable National laws) for at least the last three years. They should also have in place a system for reviewing all incidents, and recording the action taken as a result. They should record any enforcement action taken against the company over the last five years, and the action(s) which has been taken to remedy matters subject to enforcement action.	Evidence showing the way in which the organisation records and investigates accidents and incidents. Records of the last two accidents /incidents (if any) and action taken to prevent recurrence. Records of any enforcement action taken over the last five years, and what action was taken to put matters right. For larger companies, simple statistics showing incidence rates of major injuries, longer term injuries, reportable cases of ill health and dangerous occurrences for the last three years. Records should include any incidents that occurred whilst the company traded under a different name, and any incidents that occur to direct employees or labour-only sub-contractors.

9	Sub-contracting/consulting procedures (if applicable)	Organisations should have arrangements in place for appointing competent sub-contractors/consultants. Organisations should be able to demonstrate how they ensure that sub-contractors will also have arrangements for appointing competent sub-contractors or consultants. They should have arrangements for monitoring sub-contractor performance.	Evidence demonstrating how the organisation ensures sub-contractors are competent. Examples of sub-contractor assessments that have been carried out. Evidence showing how the organisation requires similar standards of competence assessment from sub-contractors. Evidence showing how sub-contractor performance is monitored.
10	Hazard elimination and risk control **(designers only)**	Organisations should have, and implement, arrangements for meeting their duties under relevant national law.	Evidence showing how designers: • ensure co-operation and co-ordination of design work within the design team and with other designers/contractors; • ensure that hazards are eliminated and any remaining risks controlled; • ensure that any structure which will be used as a workplace will meet relevant requirements of relevant national law. Examples showing how risk was reduced though design. A short summary of how changes to designs will be managed. (Note: the emphasis here should be on practical measures which reduce particular risks arising from the design, not on lengthy procedural documentation highlighting generic risks.
11	Risk assessment leading to a safe method of work **(Contractors only – including in-kind efforts)**	Organisations should have procedures in place for carrying out risk assessments and for developing and implementing safe systems of work/method statements.	Evidence showing how the company will identify significant health and safety risks and how they will be controlled. Sample risk assessments/safe systems of work/method statements. If the organisation employs less than five persons and do not have written arrangements, they should be able to describe how to achieve the above.

		The identification of health issues is expected to feature prominently in this system.	This will depend upon the nature of work, but must reflect the importance of this risk area.
12	Co-operating with others and co-ordinating work with that of other contractors **(Contractors/suppliers only – including in-kind efforts)**	Organisations should be able to illustrate how co-operation and co-ordination of their work in achieved in practice, and how they involve the workforce in drawing up method statements/safe systems of work.	Evidence could include sample risk assessments, procedural arrangements, and project team meeting notes. Evidence of how the company co-ordinates its work with other trades.
13	Welfare provision **(Contractors)**	Organisations should be able to demonstrate how they will ensure that appropriate welfare facilities will be in place before people start work on site.	Evidence could include for example health and safety policy commitment, contracts with facility providers or details of types of welfare facilities provided on previous projects.
14	Managers, scientists and engineers duties **(Managers, scientists and engineers)**	Managers, scientists and engineers should be able to demonstrate how they go about encouraging co-operation, co-ordination and communication between designers.	The evidence should be in the form of actual examples rather than generic procedures.
	Stage 2 Assessment		
1	Work experience	Individuals should give details of relevant experience in the field of work which they are applying.	A simple record of recent projects/contracts should be kept, with the phone numbers /addresses of contacts who can verify that work was carried out with due regards to health and safety. This should be sufficient to demonstrate ability to deal with the key health and safety issues arising from the work they are expecting to undertake. Where there are significant shortfalls in previous experience, or there are risks associated with the project which the individual has not managed before, an explanation of how these shortcomings will be overcome.

Appendix 3 – Health, Safety and Environmental aims and indicators

The following issues, aims and indicators have been adopted by the SKAO, to be measured, reported against and met by the Integrating Organisation, Tier 1 Work Package Contractors, other contractors and design co-ordinators across all projects undertaken.
For each indicator, the data to be analysed shall be provided by the supplier to the SKAO HSE Manager, NEC Project Manager and Head of HSSE.

The ambition is to construct, commission and operate the SKA1 project as accident, ill health, injury and pollution incident free.

Further indicators may be added as appropriate to achieve overall SKAO HSE aims and objectives.

Issue	**Aim**	**Indicator/target**
- accidents	- prevention of accidents	- zero fatalities
		- Accident frequency rate (AFR): aspirational benchmark of 1 in a million (0.1) – or equivalent statistic;
		- (Reportable accidents; total person hours worked);
		- Proportion of near miss (accident) reports: aspirational benchmark of 80%.
- health	- prevention of ill health	- Ill Health Frequency Rate (IHFR):
	- provision and use of excellent occupational	- (Reportable ill health; total person hours worked)
		- provision and attendance – health checks, health surveillance
		- provision and awareness of support available for workers returning after ill health absence
- well being	- promotion of well being	- health promotion programme activities and participation
- competence	- development and maintenance of competent workforce	- 100% site workers hold skills/competency cards or equivalent cards,
		- aspirational benchmark of five days training per year
		- training records logging all training activities including 'toolbox talks'
- designing for HSE	- reduction of HSE risk through design	- evidence of processes to identify and evaluate design options with regard to HSE risks and opportunities
		- lead designer and design coordinator Scorecards

- HSE culture	- positive HSE culture - incorporate sustainability objectives for carbon, water, waste and material into a positive HSE culture	- evidence of leadership, behaviour and culture (scorecard) - employee responses to HSE climate Surveys - indicators to quantify practice & impact
- environmental incidents	- prevention of Environmental incidents	- zero major environmental incidents (Category 1) - Significant Environmental Incident Frequency Rate (Category 1 & 2): Aspirational benchmark of 1 in a million (0.1) - evidence of processes to prevent environment incidents
- Compliance and continual improvement	- maintain a regulatory compliant project - maintain a competent work force	- zero non-compliances, breaches of planning conditions, exceedance of conditions, and zero work, prohibition, enforcement and prosecution notices - incident investigations and prevention of recurrence and compliance with project health safety and environmental plans - training and awareness records
-Carbon	- minimise carbon emissions associated with the development of the SKA	- aspirational benchmark of 50% of materials delivered to site by sustainable means - Energy use data, including fuel use
-waste	- minimise waste generation and maximise reuse and recycling	- elimination of waste through design - % of waste diverted from landfill - control and segregation of waste - Volume of remediated soil/demolition material reused
-water	- minimise use of potable water during construction	- volume of water used - % of non-potable water used
-materials	- source and use environmentally and socially responsible materials	- aspirational benchmark of 20%, by value, of construction materials to be of a reused or recycled source (and 25% recycled aggregate for permanent Works) - all timber to be sustainably and legally

		sourced from a scheme approved by CPET (or equivalent)
- biodiversity & ecology	- protect and enhance the biodiversity and ecology	- area of habitats and protection of species identified in host country IEMP's - elimination of invasive species identified in host country IEMP's - area of new habitat created
- land, water, air, noise	- optimise positive and minimise adverse impacts on land, water, noise and air quality	- groundwater, surface water, air quality and noise monitoring data - all contractors on site to have an approved project/contractor EMP prior to starting on site - to minimise flood risk on site and to adjacent areas, monitoring number of properties in flood risk as a result of works
archaeology	- record areas of archaeological significance	- identification & recording of buildings and areas of archaeological significance as identified in host country IEMP's

Appendix 4 – Design Risks

Refer to Hazard Safety Register - an appendix to [RD8] SKA1 Safety in Design Compliance Report – SKA-TEL-SKO-0001059.

Appendix 5 – Management of construction phase Health & Safety hazards and risks

Construction works carried out/commissioned by the SKAO will generally (but not exclusively) operate within United Kingdom, Australian and/or South African health and safety legislative frameworks.

Note this is not an exhaustive list; applicable elements and other hazards as determined by risk assessments shall be documented in Contractor H&E plans, referenced, as appropriate, in methods statements and safe systems of work.

Asbestos

No new asbestos use is permitted on SKAO works, but it should be noted that material in the ground may contain asbestos materials. All reasonable care, in particular during ground works and works associated with landscaping, should be undertaken when works are carried out on an SKAO site.

Such care shall include making appropriate reference to the relevant records and drawings and the enabling works validation data as part of determining safe systems of work.

If there is any suspicion that asbestos materials are present above trace amounts, work that could disturb such material and generate airborne fibres should cease immediately. The situation shall be reported to the SKAO, Integrating Organisation as soon as possible in accordance with the Integrating Organisation incident reporting procedures.

Appropriate warning signage placed in a suitable but conspicuous place on asbestos containing materials. As a result of any such identification and/or associated works, the responsible party shall ensure that the relevant construction and as-built records are updated, maintained as accessible and drawn to the attention of all parties authorised to work in the affected area.

Confined spaces

Working in confined spaces shall be eliminated/reduced as far as is practicable through design and planning.

Where such work cannot be avoided; the supplier shall undertake a suitable and sufficient risk assessment and draft a method statement documented in the relevant Integrating Organisation HSE plans taking into account regulations, Approved Codes of Practice and industry good practice, including:

- safe access;
- protection from risks such as oxygen deficiency, toxic gases, inundation, hypothermia and hyperthermia;
- risk mitigation including atmosphere testing, the provision of ventilation/air supply,
- respiratory protection, training for competence; and

- emergency precautions including supervision, communications and rescue.

Such work shall be managed in detail by a suitable and appropriate 'Permit to Work' scheme.

Existing services

Identification of existing services shall be undertaken as far as is practicable through design and planning.

To eliminate/minimise risks associated with existing services; the supplier shall undertake a suitable and sufficient risk assessment and detailed method statement documented in the Site Owner and Integrating Organisation CPHSP taking into account regulations, Approved Codes of Practice and industry good practice where applicable.

Potential danger posed by above ground or underground services poses a risk of serious injury and considerable disruption to the project.

Services can include pipes, cables and equipment associated with the electricity, gas, water (including piped sewage) and telecommunications. All excavation works shall be suitably planned.

Prior to effecting an excavation, care shall be taken to check for buried services by utilising appropriate cable and pipe location devices suitable for the task.

Consideration of local circumstances and a suitable risk assessment shall lead to a permit system that shall be supervised and monitored by the Integrating Organisation.

Excavations

To eliminate/minimise risks associated with existing services; the supplier shall undertake a suitable and sufficient risk assessment and detailed method statement documented in the Site Owner and Integrating Organisation CPHSP taking into account regulations, Approved Codes of Practice and industry good practice where applicable.

Excavation work shall be planned, managed, supervised and carried out to prevent accidents. Before excavation, the following points shall be assessed and documented in an Integrating Organisation Permit to Dig system (in accordance with relevant national Standards). This shall include, but not be limited to:

- access to the excavation;
- risk of undermining nearby structures
- contact with underground services;
- collapse of the sides;
- materials falling onto people working in the excavation;
- fumes;
- people and vehicles falling into the excavation;
- accidents to neighbouring contractors and visitors; and
- emergency procedures including rescue.

Fragile (Frangible) surfaces

Fragile surfaces shall be eliminated/reduced as far as is practicable through design and planning.

Where such materials cannot be avoided; the supplier shall undertake a suitable and sufficient risk assessment and detailed method statement documented in the Integrating Organisation CPHSP taking into account regulations, Approved Codes of Practice and industry good practice where applicable.

The supplier shall ensure that any fragile surface (brittle, frangible and likely to be broken) within or adjacent to a work area shall be identified, clearly delineated, signed and barriered to render it inaccessible.

The location of such surfaces shall be logged in the Integrating Organisation CPHSP and communicated to all personnel in the area

Hazardous substances

Working with hazardous substances shall be eliminated/reduced as far as is practicable through design and planning.

Where such work cannot be avoided; the supplier shall undertake a suitable and sufficient risk assessment and detailed method statement documented in the Integrating Organisation CPHSP taking into account regulations, Approved Codes of Practice and industry good practice where applicable.

Suppliers shall:

- seek to eliminate/minimise the use of hazardous materials (or processes which generate such materials);
- make use of materials which represent a lower hazard to people;
- ensure that all hazardous materials (purchased, generated, inherited) are subject to assessment;
- take precautions to minimise exposures, and protect personnel from exposures which cannot be avoided in receipt, storage, use and disposal;
- include appropriate health surveillance by utilising Integrating Organisation or own provision; and
- ensure that personnel are briefed and trained on the risks and precautions, including the appropriate and proper use of PPE as a last resort.

Height: working at height

Working at height shall be eliminated/reduced as far as is practicable through design and planning;

Where such work cannot be avoided; the supplier shall undertake a suitable and sufficient risk assessment and detailed method statement documented in the Integrating Organisation CPHSP taking into account regulations, Approved Codes of Practice and industry good practice where applicable.

Use work equipment or other measures to prevent falls where working at height cannot be avoided.

Use work equipment or other measures to minimise the distance and consequences of a fall should one occur.

Where practicable access provision shall minimise the use of step-ladders as working platforms and non-permanently fixed ladders in preference for fixed stairs, stairway access and other fixed equipment.

Emergency procedures for the rescue of persons working at height shall be documented and communicated to all necessary personnel.

Ionising and non-ionising radiation

The supplier shall undertake a suitable and sufficient risk assessment and detailed method statement documented in the Integrating Organisation CPHSP taking into account regulations, Approved Codes of Practice and industry good practice where applicable for the use of dosimeters etc., so as to minimise risk of personal exposure to radiation.

Exposure of workers to non-ionising radiation, such as surveying lasers, welding emissions and sunlight shall also be subject to risk assessment and suitable controls.

Lifting operations

The need for lifting operations shall be eliminated/reduced as far as is practicable through design and planning.

Where lifting cannot be avoided; the supplier shall undertake a suitable and sufficient risk assessment taking into account regulations, Approved Codes of Practice and industry good practice where applicable.

All lifting operations shall be incorporated into the Integrating Organisation CPHSP including receipt on site checks, storage, supervision, and competence of operators, slingers/riggers/load handlers, banksmen/signallers, load handling, arrangements for lifting personnel and any other relevant considerations.

Such personnel shall be holders of valid and applicable training and competence certification.

Lifting operations shall be subject to a lifting plan or a method statement (for a specific lift or for a series of repeated, similar operations).

Lifting equipment shall be marked with a unique reference, be subject to a current examination and insurance certificate available on site and be under the control of a competent person acting as lift coordinator/supervisor.

The work shall at all times be compliant with relevant national Lifting Operations and Lifting Equipment Regulations and Provision and Use of Work Equipment Regulations.

Emergency procedures shall be in place and communicated to the integrated team and the fire service for all operations that involve lifting equipment.

Loading and off loading vehicles

To eliminate/minimise the risks associated with loading and unloading of vehicles; the supplier shall undertake a suitable and sufficient risk assessment and detailed method statement documented in the Integrating Organisation CPHSP taking into account regulations, Approved Codes of Practice and industry good practice where applicable.

Loading and storage locations shall be considered as early as practicable in the planning process.

Consideration shall be given to the types of delivery vehicle, the layout of the access routes, the location of craneage and other means of distribution.

Vehicles shall not be overloaded, loads shall be evenly distributed, secured and not project beyond the sides or the back of the vehicle.

Loading and unloading procedures shall be taken into consideration during the following risk assessments and development of safe systems of work:

- workplace transport;
- working at height;
- choosing PPE;
- emergency planning/rescue procedures.

There shall be suitable and sufficient facilities to ensure that all vehicles that leave the SKAO site do not create a risk to other road users by means of dropping mud and other debris. Wheel washing facilities shall be provided when required.

-

Wheel wash facilities shall be economical and wash water produced shall discharge into a suitable processing facility.

Musculoskeletal disorders (MSDs)

Manual handling shall be eliminated/reduced as far as is practicable through design and planning;

Where manual handling cannot be avoided; the supplier shall undertake a suitable and sufficient risk assessment taking into account regulations, Approved Codes of Practice and industry good practice where applicable.

The supplier shall avoid hazardous manual handling operations so far as is reasonably practicable – through appropriate specification, procurement and site design, and the use of mechanical aids.

The supplier shall assess any hazardous manual handling operations that cannot be avoided by means of HSE approved methods or other such methods recognised by industry and shall:

- reduce the risk of injury so far as is reasonably practicable by implementing other measures; and
- ensure that personnel are briefed and trained on the risks and precautions, including methods of safe manual handling.

Noise

Noise shall be eliminated/reduced as far as is practicable through design and planning.

Where there are risks of noise that exceeds the values stated in the control noise at work regulations; the supplier shall undertake a suitable and sufficient risk assessment taking into account regulations, Approved Codes of Practice and industry good practice where applicable.

Personal Protective Equipment (PPE)

Personal protective equipment (PPE) is designed to be worn or held by a person at work to protect against one or more risks. It can include items such as safety helmets, gloves, eye protection, high-visibility clothing, safety footwear and safety harnesses. It also includes respiratory protective equipment (RPE).

Note that the use of PPE does not eliminate or reduce a hazard at source; it only acts to protect the wearer.

PPE on Site

Contractors and Suppliers shall undertake a suitable and sufficient risk assessment taking into account regulations, Approved Codes of Practice and industry good practice where applicable. They will identify all associated hazards and, if the level of risk cannot be avoided or reduced by other means, then provide, free of charge, PPE as necessary.

When identifying the type of PPE required, consideration should be given to which parts of the body require protection and the common hazards associated with these areas.

When thinking about the identified PPE, consideration should be given to likes of:

- Who is most suitable person to undertake the task?
- Are personnel trained to use the items required (such as safety harnesses and respiratory protective equipment)?
- Is the PPE appropriate for the risks involved?
- Is it suitable to use this type of PPE where exposure may occur?
- Does the PPE prevent or adequately control the risks without increasing the overall level of risk?
- Will the PPE comply with the appropriate local and national standards?
- Can the PPE be adjusted to fit users' ergonomic needs?
- Will using the PPE place any physical demands on the user?
- Do any additional controls such as time constraints, additional communication methods etc. have to be considered?
- If more than one type of PPE is being worn are they compatible?

PPE is designed to fit an average sized person, and not the individual. Poorly fitting PPE can produce additional hazards such as restricted movement and reduced visibility.

Suppliers should always ensure that any PPE provided wear is the correct fit.

Relevant PPE will include, but not be limited to:

Workwear and Hi visibility clothing:

Workwear:

Where there is a need for a higher specification of work wear the supplier shall undertake a suitable and sufficient risk assessment taking into account regulations, Approved Codes of Practice and industry good practice where applicable.

All workwear should be kept and maintained in a good condition.

Where workwear is issued, arrangements shall have to be made for identifying the wearer, issue of duplicate sets and contracts for regular cleaning. Suppliers should ensure that the correct cleaning materials are used as this can have a significant effect on the visibility of the clothing.

All personnel working on SKAO construction sites must wear basic class 2 hi-visibility garments (to EN 471, or equivalent) or other for specific risk.

<u>This includes drivers when they leave their vehicle.</u>

For routine site use it is sufficient for a tabard (sleeveless top) to be worn.

Some construction operations - for example temporary traffic management workers - need a higher standard of high-visibility. This is because construction and/or public vehicles are moving nearby at higher speed than most construction plant, meaning that drivers need to see hazards from further away to give them time to react. Because of this SKAO requirement includes high-visibility long sleeved jacket and high-visibility trousers.

Footwear:

The universal wearing of foot protection is mandatory throughout SKAO construction sites, worksites, depots and other non-office establishments. This requirement includes visitors, employees and contractors.

All safety footwear, including Wellingtons, shall incorporate impact resistant toe caps and pierce resistant midsole protection to appropriate national safety standards.

Where there is a risk of foot injury the supplier shall undertake a suitable and sufficient risk assessment taking into account regulations, Approved Codes of Practice and industry good practice where applicable.

Safety boots should be disposed of it any part rips or tears or if the sole has worn away.

Hand protection/gloves:

Unless dispensations are risk assessed, recorded in writing and approved at director level, the universal wearing of hand protection is mandatory throughout SKAO construction sites, worksites, depots and other non-office establishments. This requirement includes visitors, employees and contractors.

Eye protection:

The universal wearing of eye protection is mandatory throughout SKAO construction sites, worksites, depots and other non-office establishments. This requirement includes visitors, employees and contractors.

Where there is a need for a higher specification of work wear the supplier shall undertake a suitable and sufficient risk assessment taking into account regulations, Approved Codes of Practice and industry good practice where applicable.

Common hazards affecting the eyes include dust, chemical or metal splash, projectiles, gas, vapour and radiation.

There are a variety of eye protection products available, each item is designed to provide protection against the specific hazard e.g. safety spectacles, goggles, face screens, face shields and visors.

Head protection:

The universal wearing of head protection is mandatory throughout SKAO construction sites, worksites, depots and other non-office establishments. This requirement includes visitors, employees and contractors.

Hard hat – to appropriate national safety standards, or other for specific risk.

Hearing protection:

Where there is a need for hearing protection, the supplier shall undertake a suitable and sufficient risk assessment taking into account regulations, Approved Codes of Practice and industry good practice where applicable (hearing protection to relevant statutory regulations and national standards).

Respiratory protection:

Where there is a need for respiratory protection; the supplier shall undertake a suitable and sufficient risk assessment taking into account statutory regulations, Approved Codes of Practice and industry good practice.

Slips, trips and falls

The avoidance and management of this major issue and cause of injury on construction sites shall be reflected in the Integrating Organisation HSE plans, method statements and day-to-day practice to manage safe access and maintain a high standard of site housekeeping;

Regulatory requirements such as those laid down in the national Work at Height Regulations shall be complied.

To protect construction personnel, the materials developed by HSE (preventing slips and trips) and standards established for access equipment (e.g.: fixed scaffolding, mobile scaffolds, MEWPS,) shall be specifically referred to and reproduced in the Integrating Organisation HSE plans and RAMS.

Temporary works

Temporary works and auxiliary structures shall, as part of fitness for purpose, be designed in accordance with appropriate national standards and be subject to competent and comprehensive risk assessment by the Integrating Organisation.

Liaison is required with the SKAO Safety Manager for all such works;

Information from a Temporary Works Design team shall be provided to facilitate the updating of the overall hazard and risk register, passing this information through the Integrating Organisation to the SKAO HSE Manager.

Risks which cannot be designed out shall be carefully mitigated and controlled.

Vibration

In order to eliminate/minimise the risks associated with vibration; the supplier shall undertake a suitable and sufficient risk assessment and detailed method statement documented in the Integrating Organisation HSE plans taking into account regulations, Approved Codes of Practice and industry good practice where applicable.

The control measures shall include:

- selection of design and work methods which eliminate or reduce hand-arm and whole body vibration exposure;
- specification, use and maintenance of equipment with as low vibration exposure as possible;
- informed choice and management of equipment and processes, to minimise vibration exposure; and assessment of vibration exposures by a competent person.

Weather and its effects on operations

All works shall be planned and managed with due regard to climatic conditions that may contribute to an increase in risk of accidents or ill health.

For example, ice in winter may require responses that address slipping risks on walkways and working platforms; cold weather may trigger additional clothing issue and increased space heating; intense sunlight requires skin protection (clothing, sun-screen); high winds limit working at height and use of cranes.

Contractors in control of any work and/or work area and/or workers shall ensure that their plans and implementation take proper account of the effect of weather.

Weather reports shall be reviewed daily by the supplier.

Worksite transport: Integrating Organisation

In order to eliminate/reduce the risk associated with the movement of vehicles, equipment and pedestrians on site; the Integrating Organisation (Site Owner during Operations phase) shall undertake a suitable and sufficient risk assessment taking into account regulations, Approved Codes of Practice and industry good practice where applicable.

The Integrating Organisation (Site Owner during Operations phase) shall develop a site specific traffic management plan (as part of overall CPHSP) that adequately combines the SKAO site (primary routes and common areas), including any neighbouring third party activities, and addresses the relationship between pedestrians and vehicles.

Suppliers shall be expected to demonstrate consideration of the following in order to develop a safe system of work for workplace transport:

- vehicle routes;
- vehicle type;
- vehicle maintenance and driver checks;
- fuelling of vehicles;
- pedestrian routes and likely pedestrian footfall;
- storage location of materials and vehicles;
- condition of the terrain and foreseeable changes due to weather;
- loading and unloading procedures;
- driver training, competence, behaviour;
- information signs;
- sensible speed limits;
- suitable PPE;
- emergency procedures;
- hazards specific to the zone;
- integration with transport activities in other zones;
- supervision and monitoring; and
- effective communication.

Working in or adjacent to rivers and watercourses

To eliminate/minimise risks associated with working in or adjacent to rivers and watercourses; the Integrating Organisation shall undertake a suitable and sufficient risk assessment and prepare a detailed method statement documented in the Integrating Organisation HSE plans taking into account regulations, Approved Codes of Practice and industry good practice where applicable.

Appendix 6 – Management of construction phase environmental hazards and risks

Construction works carried out/commissioned by the SKAO will generally (but not exclusively) operate within United Kingdom, Australian and/or South African environmental legislative frameworks.

Suppliers shall identify and maintain an up-to-date detailed register of applicable environmental legislation, to be used as the basis for regulatory compliance.

Suppliers shall ensure that applicable environmental legislation and other requirements, e.g. industry best practice are taken into account in establishing and implementing works.

Suppliers shall comply with all applicable planning conditions, consents, and permits.

Preventing environmental incidents requires an evaluation of source, pathway, and receptor. Examples include encountering unexpected contamination, flooding, tunnel/trench/boring collapse, spill and leakages and fires. Incident planning includes:

- notification and reporting requirements;
- arrangements to mitigate any incident, minimising harm arising; and
- recovery arrangements and investigation, report preparation and learning.

The supplier shall consider, at a minimum, each of the following construction phase environmental hazards and methods to minimise the associated risks:

Air quality (release to air)

- limit use of ozone-depleting substances;
- reduce carbon dioxide emissions (vehicles and equipment);
- implement dust suppression techniques; and
- minimise emissions to air from demolition, contaminated land, transportation and construction.

Biodiversity and ecological (impacts and conservation)

- retain protected species and habitats;
- retain trees where practicable to do so – and always retain trees shown on planning approved drawings;
- minimise the threat to restored habitats and habitat creation from invasive plant species;
- minimise the impacts of demolition, remediation, transportation and construction works on the ecology of the site;
- minimise impacts on populations of protected or other important species; and
- minimise noise impacts on conservation area

Energy (emissions and efficiency)

- reduce carbon dioxide emissions (vehicles and equipment); and
- minimise energy demand/maximise energy efficiency.

Land (contaminated land and releases to land)

- prevent soil erosion, generation of sediment residues and surface water runoff;
- prevent releases from demolition, remediation and construction sites and treatment facilities; and
- prevent releases to groundwater.

Archaeology & Heritage

- identify and manage archaeological or built heritage sites or items of significance.

Light (impacts to local communities)

- minimise light impact to local communities.

Materials (use of raw materials and natural resources)

- consider life-cycle impacts in the choice of materials;
- segregate excavated material for reuse, treatment, storage or disposal;
- maximise selection of environmentally and socially responsible materials;
- use legally and sustainably sourced timber;
- minimise the use of toxic materials;
- minimise the use of virgin materials and maximise the reuse of demolition materials and other post consumer waste streams; and
- demonstrate how the embodied impact of specifications for the major building elements have been minimised.

Noise and vibration (impacts on local communities)

- identify and acknowledge sensitive receptors;
- local resident/businesses within a suitably assessed and defined radius of noisy works shall be pre-notified of noise and vibration levels associated with activities on site;
- selection of design and work methods which limit noise emissions;
- use of Best Practicable Means (BPM); and
- assessment of noise emissions and exposures by a competent person

Waste (management, including reuse, recycling and disposal)

- operate within the waste hierarchy of eliminate, reduce, reuse, recycle, recover, and dispose;
- reuse or recycle at least 90%, by weight, of material arising through the demolition works;
- minimise export of material and use on-site sustainable treatment of contaminated soil wherever possible;
- utilise off-site manufacture (pre-fabrication) and standardisation to minimise waste arisings on site;
- balance the cut and fill materials on site for both its permanent and temporary components; and

- maintain a high standard of site housekeeping.

Water (usage)

- minimise water demand and use non-potable water wherever practical; and
- maximise reuse and recycling of water.

Water quality (releases to water and flooding)

- prevent soil erosion and generation of sediment residues;
- prevent surface water runoff from contaminated land;
- prevent spills or leaks from impacting water quality;
- protect integrity of surface water and groundwater systems;
- manage storm water drainage and prevent flooding;
- manage works such that the flood risk is fully addressed and managed; and
- discharge to controlled waters or foul water system in accordance with consents

Appendix 7 – Construction Phase Health & Safety Plan (CPHSP)

The following headings and order indicates the SKAO preferred format for Contractor H&S plans, designed to achieve consistency across the SKAO sites. It is however recognised that house-styles and integration with Environmental plans may result in a different format. Regardless of the format used, all sections set out below must be addressed.

A Construction phase Health & Safety Plan (CPHSP) shall be developed by the Integrating Organisation, and each sub-supplier shall develop a contractor H&S Plan. Contractor H&S Plans are components of and shall support the CPHSP, and will focus on the contractors' key health & safety risks and mitigation methods/best practice associated with their activities.

Contents

Part 1 – Description of project

- version number, date, authorisation, next review;
- project description and programme details including any key dates;
- details of any design coordinator, designers, Tier 1 Work Package Contractors and other consultants; and
- extent and location of existing records and plans that are relevant to health and safety on site, including information about any existing structures.

Part 2 – Management of the work

- management structure & responsibilities, points of contact
- health and safety goals for the project (including HSE KPIs) and arrangements for monitoring and review of health and safety performance
- arrangements for:
- coordination, communication and liaison between parties on site;
- consultation with the workforce;
- exchange of relevant design information between the SKAO, Site Owner, any relevant designers, design coordinators and contractors on site;
- handling design changes;
- selection and control of contractors and other suppliers;
- exchange of health and safety information between contractors;
- site security;
- site induction;
- training and competence **(NOTE: refer to Appendix 2 of this document for further guidance)**;
- welfare facilities;
- reporting and investigation of accidents and incidents including near misses;
- production and approval of risk assessments and written systems of work;
- site rules (including drug and alcohol policy);
- monitoring, audits and management reviews;

- fire and emergency plans and procedures (including First Aid) **(NOTE: refer to [RD18] & [RD26])**; and
- external liaison including with regulators and complaints.

Part 3 – Arrangements for controlling significant site risks

Safety risks including:

- delivery and removal of materials (including waste);
- dealing with services – water, electricity, gas, including overhead powerlines and temporary electrical installations;
- interfaces with neighbouring sites, specifically through liaison with the relevant Contractor(s);
- stability of structures whilst carrying out construction work, including temporary structures and existing unstable structures;
- preventing falls;
- work with or near fragile materials;
- control of lifting operations;
- maintenance of plant and equipment;
- work on excavations and work where there are poor ground conditions;
- work on wells, underground earthworks and tunnels;
- work on or near water where there is a risk of drowning;
- work involving explosives (including suspected unexploded ordinance);
- traffic routes and segregation of vehicles and pedestrians (as part of an overall traffic management plan);
- including interface with MeerKAT or MRO Observatories and compliance with their requirements on routes under their control;
- storage of materials (particularly hazardous materials) and work equipment;
- any other significant safety risks.

health risks including:

- the removal of asbestos;
- dealing with contaminated land;
- manual handling;
- use of hazardous substances, particularly where there is a need for health monitoring;
- noise and vibration;
- work with ionising radiation;
- exposure to UV radiation (sun);
- any other significant health risk.

Part 4 – Appendices

Arrangements for collecting and gathering information for the HMD in accordance with the SKAO requirements (refer to Appendix 12).

NB: A future Engineering Management System (EMS) system, Maintenance Management and documentation Management System (incl. reports and drawings and GIS system for

environmental information are TBW by Operations.

These will include, but not be limited to:

- site layouts;
- company policies;
- additional site safety procedures (not covered above);
- meeting agendas for routine review meetings etc.

Appendix 8 – Construction Phase Environmental Management Plan

The following headings and order indicates the SKAO preferred format for Contractor and Supplier Environmental Management plans, designed to achieve consistency across the SKAO sites. It is however recognised that house-styles and integration with Health & Safety plans may result in a different format. Regardless of the format used, all sections set out below must be addressed.

A project EMP shall be developed by the Integrating Organisation, and each sub-supplier shall develop a contractor EMP. Contractor EMPs are components of and shall support project EMPs, and will focus on the contractors' key environmental risks and mitigation methods/best practice associated with their activities.

Contents

Part 1

- version number, date, authorisation, next review
- project profile and scope of works
- identification of equipment
- identification of materials used
- project duration
- environmental condition of site

Part 2

- policy statements;
- summary of significant hazards and risks (aspects and impacts) and mitigation measures:
    - activities
    - construction processes/aspects
    - environmental impacts
    - significance/risk rating (inherent risks)
    - mitigation measures
    - residual risk rating
- identification and management of environmental requirements and legislative constraints:
    - ecological constraints, including:
    - permits
    - licences
    - consents
    - planning conditions
    - regulatory notifications required and notification to residents
- environmental aims, KPIs, and targets;
- roles and responsibilities (including management structure and points of contact);

- competence, training and awareness (including requirements for inductions) **(NOTE: refer to Appendix 2 of this document for further guidance)**;
- coordination, communication and liaison:
    - internal
    - on-site
    - public
    - complaints
    - regulatory liaisons
- document & record control;
- operational control, to include:
    - MeerKAT or MRO requirements
    - reference to specific control plans (as required in the appendices);
    - contractors/designers selection and appointment; and
    - SKAO site rules and any additions for specific projects
- Emergency Preparedness & Response (including Incident Reporting and Investigation):
    - environmental incident recognition/categorisation
    - emergency plan
    - emergency procedures
    - notification and reporting
    - arrangements to mitigate
    - incident investigation (including reporting and learning.)
- environmental monitoring and reporting
    - air quality and dust
    - surface water (chemical and biological)
    - groundwater (level and quality)
    - noise and vibration
    - ground gases
    - land (quality)
    - ecology
- performance monitoring and reporting:
    - monthly report
    - HSE scorecard
- evaluation of compliance:
- inspection and audits:
    - responsibilities
    - schedule, frequency, and planning
    - HSE leadership tours
    - environmental inspections
    - environmental audits
    - non-conformance, corrective action & preventative action reports
    - procedures in the event of failure to comply with this plan
    - review and close out reports
    - record keeping and archiving

Part 3 – Appendices

- Register of legislation and other requirements;

- Schedule of permits, licenses and consents;
- Site layout drawings;
- Project specific control plans – It is intended that the programme EMP will provide the following overarching control plans
    - (Site Waste and Materials Management Plan [including a Spoil Handling Plan],
    - Transportation Management Plan,
    - Pollution Prevention and Incident Contingency Plan,
    - Water Management Plan and
    - an Ecological Management Plan.

  Each contractor will pull from and/or augment the specific control plans, to create their own project specific control plans as part of their project level EMP.

- Company policies;
- Additional environmental procedures and control plans (not covered above) (e.g.: noise and vibration; dust, odour, emissions, archaeological and lighting);
- Environmental monitoring plans (e.g.: air, noise and vibration, surface water, and groundwater);
- Document hierarchy table identifying all applicable documents (e.g.: registers, plans, method statements, templates and procedures);
- Meeting agendas for routine review meetings;
- Relevant parts of pre-construction phase information;
- Contractor environmental management plans.

Appendix 9 – Construction site – work methods

The methods of work to be employed by the supplier shall be documented and/or referenced as appropriate in their HSE plans, RAMS (risk assessments and method statements) and in operational and other guides and manuals.

Such methods shall include permits to work for a variety of activities including entry into confined spaces, work on live services (including where such services may be isolated and then reconnected), work which may prejudice any emergency facilities including fire protection or fire fighting systems, hot work, and permits to proceed (with regard to contaminated land).

The defined methods shall address all identified significant hazards, including the protection of services, site transport, and hazardous materials.

The HSE plans and RAMS shall reflect the specific hazards and risks of the project and the phase of project. Thus, for site investigation, land remediation, landscaping, tunnelling, service relocations, etc. the HSE plans, updated hazard and risk register, RAMS and other relevant documents shall be up-to- date, suitable and sufficient to define the way in which the high standards for HSE shall be achieved and maintained.

Safe working methods are the responsibility of the relevant suppliers (those directly engaged in the work) and the Integrating Organisation who shall develop appropriate RAMS and implement site work activities to ensure health and safety is maintained. However, the SKAO may require some safe working methods to be made available for discussion within the integrated team, headed by the Integrating Organisation for a particular package of work, a design coordinator (or equivalent) and the Site Owner (if appropriate), before they are implemented. This shall occur where the integrated team agrees that the arrangements are of particular significance, importance or complexity. In these circumstances the integrated team shall review the draft RAMS and development of the HSE plans, and seek to reach agreement that they are suitable and sufficient before the particular work activities commence on site.

Permits to work shall be required for a range of high risk activities, such as hot work, entry into confined spaces, excavating in the suspected vicinity of buried services, etc.

The Integrating Organisation shall ensure that the permit system is operating effectively on works under their control, and that the arrangements are:

- documented in the Integrating Organisation CPHSP;
- referenced as appropriate in RAMS;
- reflected in training including toolbox talks for personnel directly engaged in permitted work; and
- carefully recorded and communicated to third parties as appropriate

Appendix 10 – Construction site – plant and equipment

Selection

The supplier shall select equipment suitable for the use for which it is intended. As far as practicable, choices shall be made which address:

- safety in use and maintenance;
- noise and vibration minimisation;
- low toxicity use and maintenance;
- low energy usage;
- low exhaust emissions;
- suitable maintenance schedules; and
- compliance with relevant national legislation (typically, but not limited to UK, Australian or South African).

Register

The supplier shall prepare and maintain a register of Plant and Equipment and Statutory Certification, identifying:

- plant and equipment item;
- unique identification;
- test certification and renewal date;
- examination certificate and renewal date; and
- operator training certification and renewal date.

This register shall also comply with any statutory registration Regulations where applicable – subject to assurance checks by the Integrating Organisation.

Lifting equipment

Selection of suitable equipment and competent and comprehensive planning for safety of individual lifts are essential. Each item of plant and equipment shall be managed in accordance with all statutory national Regulations, the manufacturer's guidelines, Approved Codes of Practice and other guidance applicable.

This shall apply to:

- testing and engineering commissioning;
- inspection and maintenance;
- competent persons; and
- training, such that equipment operators shall hold relevant training cards/records (or other certification reviewed and accepted at HoHSSE level where the activity is not covered by a specific category).

Records shall be kept to include:

- Proof of registration of tower cranes (where applicable) following Thorough Examination, and any subsequent Thorough Examination after such tower crane is reconfigured, re-tested after 6 monthly statutory period (or national equivalent), or any after any other significant event;
- inventory of other lifting plant and equipment;
- the purpose/ permissible use for which it has been provided;
- testing and engineering commissioning details, and standards met;
- maximum safe working load;
- inspection and examination reports;
- maintenance details;
- personnel training records and authorisations to use; and
- supervised use of plant and equipment.

Note: any lifting accessories shall also be subject to examination and testing

Specific plant requirements

Machine excavators

Where a machine excavator is over 5 tonnes and fitted with a 'quick- hitch' device, the quick-hitch must be of the 'Next Generation' fully automatic, locking type, which in the event of hydraulic failure, will fail in the 'safe' condition, and not allow any attachment connected to the quick-hitch to detach.

For machines below 5 tonnes (including back actor machines), manual quick-hitches will still be permitted following a suitable and sufficient risk-assessment.

Access equipment

Arrangements for working at height shall be in accordance with the appropriate national work at height Regulations and the primary consideration shall be to avoid working at height wherever reasonably possible.

Erected steel tube scaffolding shall be subject to formal design. This shall be marked at all designated access points (e.g. by Scafftag or equivalent system) to identify:

- date of erection, supplier and competent person responsible;
- designed loading (tonnes);
- date of last inspection, name of competent inspector;
- note that all access equipment shall have a clear and unambiguous method for notifying "out of use";
- all aluminium tower access equipment shall be under the control of a competent person, trained to the appropriate national standards and holding a certificate; prior to use, each newly erected tower shall be inspected by such a competent person;
- ladders shall be carefully stored, issued, used and managed to minimise unauthorised use; and
- ladders and step-ladders may be used as a means of access, but shall not be regarded as suitable working platforms/places of work.

Mobile equipment

- All mobile equipment used off the public highway shall be fitted with the following as standard:
- a visible and audible reversing alarm, (care needs to be taken in zones that border properties outside the SKAO site);
- a flashing yellow hazard warning beacon operating during all movement;
- all to be fitted with mirrors etc.;
- large items of mobile plant shall be fitted with CCTV or other suitable aid to facilitate safe reversing and other manoeuvres;
- cabs shall be designed to protect the driver from noise, provide a comfortable working environment by excluding dust, providing heat in winter etc.;
- seating shall be designed to minimise whole body vibration; and
- vehicles which may be used on the public roads and are brought onto site shall have valid test certificates at all times;
- Mobile plant, other than vehicles travelling normally on designated site roadways, used in areas where other site personnel may be present shall only be operated with the guidance of a designated 'banksman' giving approved signals in accordance with national standards;
- If any mobile equipment is to be used within an area for which a height restriction has been advised, the supplier shall check and if the equipment is less than that height or higher this shall be notified to the Integrating Organisation prior to the equipment being used within that area.
- Passengers may only be carried if there is a proper place provided for this purpose. Unless a safe place has been designed into the mobile plant, no person may remain on/in the vehicle during the loading/unloading of any loose materials.
- The selection and use of any mobile equipment shall be considered during the assessment undertaken for determining the safe working procedures that form the transport zone management plan, integrating with the SKAO site (primary routes) plan and neighbouring plans if applicable.

Electrical equipment

Site electrics shall comply with National standards (e.g. SANS 10142 and AS/NZS 3000).

The permissible power usage on a circuit or transformer should not be exceeded.

Electrical supplies in welfare, office and other long-lived facilities shall be designed, installed and maintained by competent persons in accordance with national standards, formally commissioned and subject to regular inspections and tests. Electrical equipment shall be subject to regular inspection and testing, and records kept.

Tools

Tools should be inspected prior to each usage to check their condition and suitability. Electrically powered hand tools shall operate in accordance with national standards, and be

double insulated or battery-powered. Power tools should be appropriately guarded, marked with maximum speeds, provided with on/off and emergency stops.

Equipment noise

Site plant shall comply with relevant statutory AUS/ZA noise limits, but beyond this there are other steps to be taken to minimise local impact:

- processes, such as piling, which may generate significant noise shall be designed subject to the control hierarchy, seeking to eliminate or reduce noise emissions at source and by process design;
- electrically powered plant shall be preferred, where practicable;
- compressors that are sound reduced models fitted with sealed acoustic covers shall be used; and
- all generators and compressors used on the site shall be sound reduced models fitted with acoustic linings and all ancillary pneumatic percussive tools shall be fitted with mufflers or silencers of the type recommended by the manufacturers.

Noisy equipment such as ventilation fans, which are required to run continuously, shall be housed. If necessary, to comply with the maximum permitted noise levels given below, the enclosure shall be lined with sound absorbent material:

- Stationary plant and equipment shall be located as far away as possible from sensitive receptors and away from walls;
- Hoardings, housings and temporary stockpiles shall be used to screen noise. The hoardings, built to a standard height of 2.4m (or national equivalent), shall be constructed such that all knotholes, cracks and other joints are sealed to minimise potential noise impact;
- Doors on plant and equipment shall be closed and equipment shut down in the intervening periods between uses;
- All plant and equipment shall be properly maintained;
- Deliveries to site shall be programmed for daytime working hours only and routed to minimise disturbance to local residents. Delivery vehicles shall be prohibited from waiting within or near to the site with their engines running;
- Timings of activities which may generate significant noise shall be planned with regard to local residents and sensitive receptors, in liaison with Integrating Organisation especially for planned out-of-hours working and in accordance with the relevant consent(s) from any statutory authorities.

Appendix 11 – Alcohol and Drugs Policy

All suppliers' personnel are prohibited from consuming alcoholic drinks or consuming or using illegal drugs at work, or from being under the influence of alcohol, drugs or other substances that might impair the proper performance of their duties on site.

Alcohol

Personnel shall not to consume alcohol whilst on duty, during breaks in the working day, including breaks spent away from the site.

Personnel shall neither buy alcohol during their normal working hours nor bring alcohol on to site. Alcohol shall not be sold on site. Personnel shall limit their consumption of alcohol whilst off duty to ensure that they are not under the influence of alcohol in any way when reporting for duty or carrying out work on site.

All personnel shall cooperate fully with the alcohol testing arrangements.

Drugs

Personnel shall not consume or use illegal drugs at any time, whether on site or not, so as to ensure they are not under their influence when reporting for duty or carrying out site work. Personnel shall not possess, store or sell illegal drugs on site.

When requiring medication, personnel shall find out if there may be side effects likely to impair their work performance (by informing Integrating Organisation or notifying the occupational health provision made by their employer) and safety from the drug or other medication concerned, whether prescribed or available without prescription, and, where this is the case, to seek advice regarding alternatives from their medical adviser or from Integrating Organisation. If they are advised that impairment may arise, they should advise their manager when reporting for work so that appropriate restrictions may be put in place on the duties they may undertake whilst on the medication.

All personnel shall cooperate fully with the drugs testing arrangements.

Testing for drugs and alcohol, certification and evidence

When required by their manager, Integrating Organisation or by authorised SKAO representative, the supplier's personnel shall cooperate by providing breath tests or specimens for analysis in the following circumstances:

- unannounced and on a random basis;
- when suspected of a breach of this policy; and
- following an incident.

Failure to comply with this requirement may result in action against the individual including exclusion from site and repeated failures of the supplier's personnel to comply may result in sanctions against the supplier

Supplementary guidance

In order to start work with a zero alcohol level, suppliers' personnel should not consume any alcohol at all in the eight hours before starting work and, in the 16 hours prior to that, should not consume more than seven units of alcohol. In respect of compliance with the standard, breathalyser tests are set at the statutory limit for driving on public roads.

Integrating Organisation or authorised SKAO representatives, including security personnel, shall refuse entry or access to the supplier's personnel if they are suspected of being under the influence of or unfit for duty because of alcohol or drugs, or through the supplier's request that the personnel concerned leave the site.

The supplier shall have systems in place to show that due diligence has been exercised to ensure that all personnel comply with the alcohol and drugs standard

Following a serious incident all the supplier's personnel involved in the incident may be subjected to post incident alcohol and drugs testing. The supplier is responsible for ensuring that personnel present for testing which shall be undertaken as soon as possible after the incident. A serious incident is defined as an incident causing or having the potential to cause death or major injury or substantial damage to property.

The supplier shall have controls in place to ensure that their personnel do not report for duty or start work on any site under the influence of alcohol or drugs. If the supplier, Integrating Organisation, Site Owner or authorised SKAO representative suspects or has clear evidence that a supplier's employee has consumed alcohol or drugs or is under the influence of them whilst on duty, the individual shall stop work immediately, leave the work site and submit to alcohol and drugs tests as soon as possible.

Suppliers shall ensure cooperation with random alcohol and drugs testing. The sampling shall achieve ten percent of site personnel being tested during each year.

Appendix 12 – Health, Safety and Environmental Management Database (HMD)

General

It is intended that a health, safety and environmental management database (HMD) will be produced for SKAO Operations and Maintenance, by the Integrating Organisation, prior to formal completion (sectional or otherwise) of completed Works to SKAO.

Acceptance of the HMD will be made by the SKAO Head of HSSE, on behalf of SKAO Director of Operations.

As a minimum, the HMD should contain the information needed to allow future construction work, including cleaning, maintenance, alterations, refurbishment and demolition to be carried out safely. Information in the HMD should alert those carrying out such work to risks, and should help them to decide how to work safely.
The HMD will be useful to:
(a) SKAO, acting in a future Client or Principal Contractor role, who will have a duty to provide information about their premises to those who carry out work there;
(b) Designers during the development of further designs or alterations;
(c) Design co-ordinators preparing for future construction work;
(d) Principal contractors and contractors preparing to carry out or manage such work.

The HMD will form a key part of the information that the SKAO, or acting agents, will require to provide for future construction projects under various national statutory HSE legislation.

The HMD will therefore be kept up to date after any relevant work or surveys. The scope, structure and format for the HMD will be agreed between the SKAO and relevant dutyholders and partners, stakeholders or suppliers at the start of future projects. There can be a separate HMD for each structure, one for an entire project or site, or one for a group of related structures. The HMD may be combined with the Building Regulations Log Book (or equivalent), or a maintenance manual providing that this does not result in the health and safety information being lost or buried. What matters is that people can find the information they need easily and that any differences between similar structures are clearly shown.

What dutyholders must do

SKAO, Designers, Integrating Organisation, Tier 1 Work Package Contractors, other contractors and design co-ordinators all have various legal duties (depending on country of location) in respect of the HMD:
(a) Design co-ordinators must prepare, review, amend or add to the HMD as the project progresses, and give it to the Client at the end of project;
(b) SKAO, Designers, Integrating Organisation, Tier 1 Work Package Contractors, and other Contractors must supply the information necessary for compiling or updating the HMD;
(c) Clients must keep the HMD to assist with future construction work; and
(d) Everyone providing information should make sure that it is accurate, and provided promptly.

Following SKA1 completion, the HMD must be updated as part of all significant maintenance projects. For some projects, for example redecoration using non-toxic materials, there may be nothing of substance to record. Only information likely to be significant for health and safety in future work need be included. It is not intended to produce a HMD on the whole structure if a project only involves a small amount of construction work on part of the structure.

SKAO should make sure that the Integrating Organisation (assisted by all relevant Work Package Tier 1 Contractors) compiles the HMD. In some cases, for example design and build contracts, it may be more practical for the Integrating Organisation to obtain the information needed for the HMD from Tier 1 specialist sub-contractors. In these circumstances the Integrating Organisation can assemble the information and give it to the SKAO as the work is completed.

It can be difficult to obtain information for the HMD after Designers or Contractors have completed their work. What is needed will be agreed in advance (prior to commencement of construction) to ensure that the HMD information is prepared and handed over in the required form and at the right time.

The contents of the HMD

When putting together the HMD, the Integrating Organisation should consider including information about each of the following where they are relevant to the health and safety of any future construction work (during Operations phase).

The level of detail should allow the likely risks to be identified and addressed by those carrying out the work:
(a) a brief description of the work carried out;
(b) any residual hazards which remain and how they have been dealt with (for example surveys or other information concerning asbestos; contaminated land; water bearing strata; buried services etc.);
(c) key structural principles (for example, bracing, sources of substantial stored energy - including pre- or post-tensioned members) and safe working loads for floors and roofs, particularly where these may preclude placing scaffolding or heavy machinery there;
(d) hazardous materials used (for example lead paint; pesticides; special coatings which should not be burnt off etc.);
(e) information regarding the removal or dismantling of installed plant and equipment (for example any special arrangements for lifting, order or other special instructions for dismantling etc.);
(f) health and safety information about equipment provided for cleaning or maintaining the structure;
(g) the nature, location and markings of significant services, including underground cables; gas supply equipment; fire-fighting services etc.;
(h) information and as-built drawings of the structure, its plant and equipment (for example, the means of safe access to and from service voids, fire doors and compartmentalisation etc.).

The HMD does not need to include things that will be of no help when planning future construction work, for example:
(a) pre-construction information, or construction phase plan;

(b) construction phase risk assessments, written systems of work and COSHH assessments;
(c) details about the normal operation of the completed structure;
(d) construction phase accident statistics;
(e) details of all the Contractors and Designers involved in the project (though it may be useful to include details of the Integrating Organisation and any design co-ordinator);
(f) contractual documents, redundant statutory certifications and/or notifications etc.;
(g) information about structures, or parts of structures, that have been demolished - unless there are any implications for remaining or future structures, for example voids;
(h) information contained in other documents, but relevant cross-references should be included.

Storing the HMD after the work is complete

To be useful the HMD needs to be kept up to date, and retained for as long as it is relevant - normally the lifetime of the structure.
It may be kept electronically (with suitable backup arrangements), on paper, on film, or any other durable form.
Where the SKAO disposes of their entire interest in a structure, they will pass the HMD to the new owners and ensure that they are aware of the nature and purpose of the HMD. Where they sell part of a structure, any relevant information in the HMD will be passed or copied to the new owner.

Appendix 13 – Plan for the future review and revision of the HSE Plan

Description	Timing	Notes
HSE Plan revision 4.0	Post System CDR – approx. May 2020	Incorporation of feedback and required changes following System CDR. Further focus on Construction Planning and Procurement Phases including, but not limited to, definition of HSE KPI's and indicators. Include relevant outputs (if any) from further HAZCON, HAZCOMM and HAZOPs. Draft format of HMD. HSE planning for systems integration, verification and engineering commissioning, including HSE acceptance procedures. Development of programme-level Environment and Sustainability Management System (ESMS).

HSE Plan revision 5.0	Prior to start of Construction (T=0) and/or establishment of SKA Observatory (incl. Post Construction Proposal Approval) – approx. Dec 2020	Incorporation of feedback and required changes following Construction Proposal approval. Development of SKA1 HSE construction procedures aligned with Host Country requirements (including Integrating Organisation, Site Owner HSE duties and responsibilities). Finalisation of HSE planning for systems integration, verification and engineering commissioning, including HSE acceptance procedures. Change in document name to reflect transition from PLC (Organisation) to IGO (Observatory). Include relevant outputs (if any) from further HAZCON, HAZCOMM and HAZOPs. Final format of HMD. Develop Safety Incentives Programme (in liaison with Integrating Organisation and Tier 1 Contractors).
HSE Plan revision 5.0 a, b, c…	Annually	Regular annual review during Construction & Engineering Commissioning/I&V phases of SKA1. Ongoing development of Observatory HSE operational procedures aligned with Host Country requirements (including Integrating Organisation, Site Owner HSE duties and responsibilities). Include relevant outputs (if any) from further HAZCON, HAZCOMM and HAZOPs.

HSE Plan revision 6.0	Prior to start of “steady state” Operations.	Before 6 months of the appointment of the first SKA Observatory Operations contractor with work on site or before any SKA Observatory Operations work starts on site, whichever is the sooner. Include relevant outputs (if any) from further HAZOPs.
HSE Plan revision N+1	Thereafter annually unless otherwise agreed with HoHSSE.	