



ONR GUIDE			
LC 27 Safety Mechanisms, Devices and Circuits			
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1 INTRODUCTION

- 1.1. Many of the licence conditions attached to the standard nuclear site licence require, or imply, that licensees should make arrangements to comply with regulatory obligations under the conditions. ONR inspects compliance with licence conditions, and also with the arrangements made under them, to judge the suitability of the arrangements made and the adequacy of their implementation. Most of the standard licence conditions are goal-setting, and do not prescribe in detail what the licensees' arrangements should contain; this is the responsibility of the duty-holder who remains responsible for safety. To support inspectors undertaking compliance inspection, ONR produces a suite of guides to assist inspectors to make regulatory judgements and decisions in relation to the adequacy of compliance, and the safety of activities on the site. This inspection guide is one of the suite of documents provided by ONR for this purpose.
- 1.2 LC 27 is one of the licence conditions which does not formally require the licensee to make and implement adequate arrangements. This is discussed more fully in paragraph 5.1.

2 PURPOSE AND SCOPE

- 2.1 This guidance has been prepared as an aid to inspection activities carried out by Nuclear Inspectors at the Office for Nuclear Regulation in judging the licensees compliance with the requirements of LC 27. This guidance provides a framework for these inspection activities within which the Inspector is expected to exercise his/her discretion. This framework is provided to facilitate a consistent approach to LC 27 compliance inspection.
- 2.2 The guidance is for use by all Nuclear Inspectors in ONR. The guidance does not indicate when or to what extent LC 27 inspections should be carried out as these matters are covered in individual inspector's inspection programmes.
- 2.3 The guidance provided is split into four main elements:
 - (i) Purpose of licence condition.
 - (ii) Guidance on arrangements for LC 27.
 - (iii) Guidance on inspection of arrangements/procedures for LC 27.
 - (iv) Guidance on inspection of implementation of arrangements/procedures for LC 27.

3 LICENCE CONDITION 27 – SAFETY MECHANISMS, DEVICES AND CIRCUITS

- 3.1 This licence condition states:
- 3.2 The licensee shall ensure that a plant is not operated, inspected, maintained or tested unless suitable and sufficient safety mechanisms, devices and circuits are properly connected and in good working order.

4 PURPOSE OF LICENCE CONDITION 27

- 4.1 LC 27 is a standard condition attached to all Nuclear Site Licences. Nuclear site licensees are required to comply with the LC. How this compliance is achieved is for the licensees to decide. However, ONR must judge the adequacy of this compliance. It carries out this function by compliance inspection.
- 4.2 The purpose of this licence condition is to ensure that plant is not used unless the necessary Safety Mechanisms, Devices and Circuits (SMDCs) are installed and functioning.
- 4.3 An important aspect of LC 27 is the definition of a SMDC. This enables a clear understanding of what is and what is not a SMDC. An appropriate definition of a SMDC is taken from ONR's Safety Assessment Principles for Nuclear Facilities (SAPs) [1]. Safety System is defined in the Glossary of the SAPs as "A system that acts in response to a fault to protect against a radiological consequence". This is adopted as a suitable definition of a SMDC.
- 4.4 A SMDC is required to act in response to a fault, i.e. when something has gone wrong (e.g. an interlock that prevents a shield door opening when high gamma is present is responding to the fact that high gamma exists at a time when the door is attempting to be opened - i.e. something must have gone wrong for the condition to have arisen), hence it has no role in normal operations. A corollary of this is that removal of the SMDC's safety function (which may or may not be the same as removal of the system as a whole) will not interfere with normal operations. This is an aspect that can be used as an indicator when there is doubt as to the correct classification of a SMDC.
- 4.5 Although the definition of a SMDC states that the SMDC 'acts' in response to a fault, it is convenient to interpret this term broadly so as not to exclude systems which carry out their function passively, e.g. structures, sumps, containments etc. It is appropriate to classify such systems as SMDCs if they are able to prevent an accident in response to a fault. In these cases they can be considered to 'act' by bearing without failure the additional stresses imposed by the fault.
- 4.6 It should be noted that systems which protect against industrial safety consequences only are not SMDCs. SMDCs must have a role in protecting against a radiological consequence.
- 4.7 Further relevant details are in the Safety Systems Engineering SAPs ESS.1 to ESS.27. Examples of SMDCs and examples of non-SMDCs are in Table 1. In addition ONR's Nuclear Technical Assessment Guide NS-TAST-GD-003 – Safety Systems provides further detailed guidance regarding the requirements for SMDCs.
- 4.8 The suitability and sufficiency of the SMDCs would normally be expected to be identified in the safety cases required under LC23(1) for any operation that may affect safety. SAP ESS.2 "Safety System Specification" is particularly relevant. In detail this SAP notes that "The extent of safety system provisions, their functions, levels of protection necessary to achieve defence in depth and reliability requirements should be specified".

- 4.9 SMDCs are deemed to be in good working order if they have been maintained in accordance with the LC 28 Plant Maintenance Schedule and routine surveillance of them shows no evidence of them not working properly.

5 GUIDANCE ON ARRANGEMENTS FOR LC 27

- 5.1 This licence condition does not formally require the licensee to make and implement adequate arrangements, but to effectively comply with this condition we would expect the licensee to have established procedures which ensure that safety cases clearly identify any necessary SMDCs and the permitted configurations of them necessary to assure safety. The procedures should also establish responsibilities for ensuring that the plant is only operated when these conditions are met and define procedures for checking the configuration of the SMDCs and for confirming their functionality. Such arrangements or procedures, which will help demonstrate compliance with the condition, also facilitate inspection and enable compliance with this condition to be audited.

6 GUIDANCE ON INSPECTION OF ARRANGEMENTS/PROCEDURES FOR LC 27

- 6.1 Part 6 of this guidance is to assist inspectors in judging the adequacy of the licensee's arrangements. The following list is neither exclusive nor exhaustive and will be subject to review and revision in light of operational experience. It does however; provide a hit list of aspects of LC 27 that can be examined during routine inspections.
- 6.2 Inspect the licensee's procedures and confirm that they have been reviewed in accordance with the Quality Management System requirements and that the identified responsible persons are correct.
- 6.3 Check that the procedures ensure:-
- (a) SMDCs appropriate for any operations are identified from the plant safety case;
 - (b) all SMDCs receive regular and systematic examination, inspection, maintenance and testing under LC 28 arrangements to ensure that they are kept in good order.
 - (c) there is a system in place to ensure that sufficient SMDCs are in place and operable at all times;
 - (d) persons responsible for ensuring compliance with this requirement are identified; and
 - (e) where non-compliance is found, this is notified, recorded and reported as required by LC 7 and that action is taken to rectify or immediately install new equipment or shutdown the affected process or plant. Confirm the procedures identify the person responsible for ensuring this is done.
- 6.4 Check that the procedures require suitable records to be kept to demonstrate compliance with this condition. These records should be identified in LC 25 arrangements and be kept in accordance with LC 6 procedures.

7 GUIDANCE ON INSPECTION OF IMPLEMENTATION OF ARRANGEMENTS/PROCEDURES FOR LC 27

- 7.1 Part 7 of this guidance is to assist inspectors in judging the adequacy of the licensee's implementation of their procedures i.e. is the licensee complying with the procedures. The following list is neither exclusive nor exhaustive and will be subject to review and revision in light of operational experience. It does however; provide a hit list of aspects of LC 27 that can be examined during routine inspections.
- 7.2 Ensure that the boundary of the SMDC has been appropriately defined to ensure that all constituent sub-systems and components required to ensure the SMDC is able to perform its safety function have been included. For manually actuated systems this should include any claimed alarm/indication systems.
- 7.3 Establish from safety cases or other sources derived from them which SMDCs are required under the various conditions of operation of the plant.
- 7.4 Establish that the operating instructions (LC24) require the availability of required SMDCs for a particular plant state (as identified under LC23) to be confirmed prior to planned entry into such a state.
- 7.5 Confirm that the SMDCs are on the LC 28 Plant Maintenance Schedule and subject to maintenance, inspection or test as declared in the safety case and to periodic surveillance by the operators.
- 7.6 Confirm at the time of the inspection that these requirements are being met, noting in particular any SMDCs which are unavailable for whatever reason and confirming that the essential requirements are still being met.
- 7.7 Where any "substitution" or equivalent arrangements have been implemented in the event of unavailability of any claimed SMDCs; the inspector should ensure that they have been appropriately implemented and that they provide a broadly equivalent line of protection.
- 7.8 Examine maintenance instructions/proof tests to ensure that where reasonably practicable a full end-to-end test is being completed to confirm availability of the SMDC.
- 7.9 Periodically carry out a physical check on a sample of accessible SMDCs which should include an assessment of the material condition of the SMDC and its labelling.
- 7.10 Ensure where SMDCs are supported by essential services such as electricity, cooling water etc... that these services are classified and maintained accordingly. Essential services that support components of a system important to safety should be considered part of that system and should be classified accordingly unless failure does not prejudice successful delivery of its safety functions.
- 7.11 Examine information on the availability and reliability of the SMDC and compare this with relevant safety case requirements.

- 7.12 Inspect any declared records of compliance with the condition and review a sample of logs, isolation certificates, permit to work and maintenance records to test their veracity. Confirm that any failures to meet requirements were handled under LC 7 arrangements and reported appropriately.

8 REFERENCE

- 8.1 ONR publication, "Safety Assessment Principles for Nuclear Facilities", 2014 Edition, Version 0. <http://www.onr.org.uk/saps/saps2014.pdf>

Examples of SMDCs		Examples of non-SMDCs
Reactor pressure vessel safety relief valves		Reactor pressure vessel
Main boiler safety relief valves on gas-cooled reactors		Reactor fuel
Reactor guardlines and trip amps		Fuel pond cooling system
Backup diesel generators		Main boiler feed pumps
Radwaste sump alarms		Geometrically safe process vessels
Fire detection and suppression systems		
Fuel pond leakage and detection systems		
Nuclear significant fire doors		
Flooding defences (e.g. sea wall etc)		
Criticality Warning and Detection Systems		

Table 1 Examples of SMDCs and Examples of non-SMDCs