



SAFETY ASSESSMENT
FEDERATION

Guidance

In-Service Inspection Procedures

Identifying Safety Critical Components and Assessing Their Integrity

REFERENCE: MLCC 07

ISSUE: 01.1

DATE: 20/10/17

DOCUMENT INFORMATION:

REFERENCE: MLCC 07

ISSUE: 01.1

DATE: 20/10/17

PREPARED BY: Machinery Lifts and Crane Committee

APPROVED BY: TC 2 and TSC

DOCUMENT HISTORY RECORD:

ISSUE: DATE: CHANGE DETAIL:

01 22/09/2003 Initial Document

01.1 20/10/17 ocument review

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CONTENTS

SITUATION 1

GUIDANCE..... 1

1. Introduction 2

2. Identifying a SCC 3

3. Assessing the integrity of a SCC..... 3

4. APPENDIX I - IDENTIFICATION OF A SAFETY CRITICAL COMPONENT 4

5. APPENDIX II - NON-EXHAUSTIVE LIST OF POSSIBLE FAILURE MODES AND FACTORS THAT COULD HAVE AN INFLUENCE ON THEM 5

6. APPENDIX III - NON-EXHAUSTIVE LIST OF TYPICAL EXAMPLES OF LIFTING PLANT SCCS..... 6

7. APPENDIX IV - non-exhaustive list of possible factors that could HAVE AN INFLUENCE ON the likelihood of failure of a SCC..... 7

8. APPENDIX V - ASSESSING THE INTEGRITY OF A SCC 8

SITUATION

An essential part of any thorough examination or inspection of an item of work equipment is to identify any or all Safety Critical Components (SCCs) Once SCCs have been identified, appropriate examination/test procedures should be implemented to confirm the integrity of every SCC.

What is the recommended procedure to be adopted for identifying SCCs and what should be taken into consideration when deciding upon how to confirm their integrity?

GUIDANCE

Aim

This Guidance aims to outline the procedure to be adopted for identifying Safety Critical Components and what should be taken into consideration when deciding upon how to confirm their integrity.

Definitions

For the purposes of this Guidance, the following definitions apply:

- **Competent Person (CP)** – A person who has the appropriate practical and theoretical knowledge and experience of the equipment to be thoroughly examined/inspected as will enable them to detect defects or weaknesses and to assess their importance in relation to the safety and continued use of the equipment.
- **Safety Critical Component (SCC)** - Any component of an item of equipment which, should it or any part of it fail singularly, could cause a serious hazard

[Note: A SCC may include back up safety device(s), which would come into operation, in the event of single component failure.]

- **Serious Hazard** - A potential to cause serious injury or death to a person or persons

1. Introduction

The CP who undertakes a thorough examination of lifting equipment should, under all circumstances, carry out an assessment of the condition of those components, parts or systems, which could through deterioration lead to a dangerous situation.

[Note: When undertaking an inspection of non-lifting work equipment in accordance with the Provision and Use of Work Equipment Regulations 1998 the same principles may apply.]

The scope and extent of a thorough examination of lifting equipment will depend on an assessment of the risks associated with the probability and consequences of deterioration or failure of the parts, components or systems under consideration.

The CP undertaking the thorough examination will also need to consider the type and configuration of the lifting equipment, the situation in which it is operated and in some cases records of maintenance, repairs, inspections etc.

In general terms a thorough examination will include a condition assessment of:

- All parts or components in line of stress (e.g. load bearing components)
- All operational safety components or devices (e.g. those parts or components which contribute to the safe operation under normal use, such as enclosures, guarding, interlocking devices, operational controls, operational travel limits, operational brakes etc.)
- All secondary safety components or devices (e.g. those parts or components which function only when the lifting equipment operates, for whatever reason, outside its normal working envelope. Such parts may include overtravel, overhoist, overspeed or overload devices, emergency stop, fall arrest systems, driver protection systems etc.)

The extent of the condition assessment for a given part, component or system will be proportional to the consequences of malfunction or failure, special attention must be paid to those SCCs where single component failure could result in death or serious injury.

Therefore, an essential part of any thorough examination of lifting equipment is to identify any or all SCCs. Once SCCs have been identified, appropriate examination/test procedures should be implemented to confirm the integrity of every SCC. Where any supplementary inspection/test procedures are undertaken in support of the thorough examination the results should be recorded.

2. Identifying a SCC

It is important that the CP undertaking a thorough examination/inspection of an item of equipment adopts a systematic approach in order to identify any or all SCCs.

As part of the systematic approach, the competent person will need to analyse the profile, shape and configuration of the item of equipment in order to identify load paths and possible failure modes of individual components and the entire equipment. It is important to note that possible failure modes can result from static or dynamic forces.

The assessment should consider each component against all likely failure modes with the aim of identifying whether the single failure of that component, or any part of it, would have the potential for causing a serious hazard (Refer to Appendix I). When reviewing the different failure modes consideration should be given to the various factors that could have an influence on the failure modes. Appendix II to this Guidance provides a non-exhaustive list of possible failure modes and also so factors that could have an influence on them.

If the assessment shows that a single failure of the component or any part of it could cause a serious hazard, then that component is a SCC. Appendix III to this Guidance provides a non-exhaustive list of typical examples of lifting plant SCCs.

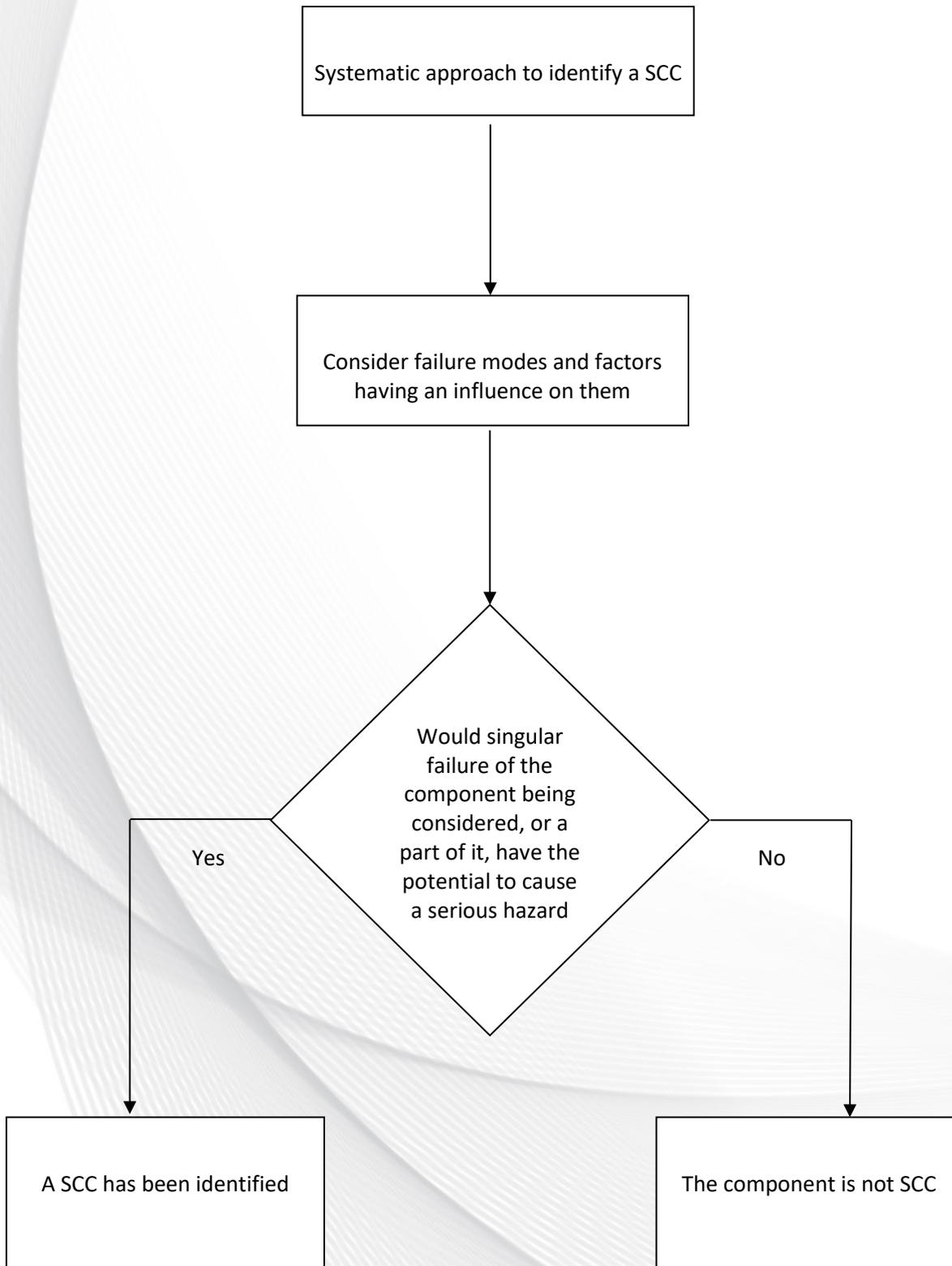
3. Assessing the integrity of a SCC

Once a SCC has been identified, its integrity should be the subject of special consideration at each thorough examination. The possible factors effecting its likelihood of failure should be carefully considered when deciding what actions need to be taken in order to establish the integrity of the SCC.

There may be occasions when it is necessary to delegate the examination or test of a SCC to a third party. In such cases, when such an examination or test is made a requirement by a competent person at one thorough examination, it may not be possible to complete the next thorough examination if sufficient documentary evidence of that examination or test having been satisfactorily completed is not available.

Appendix IV to this Guidance provides a non-exhaustive list of possible factors that could have an influence on the likelihood of failure of a SCC. Guidance on how to confirm the integrity of a SCC during a thorough examination/inspection is provided by way of a flowchart at Appendix V.

4. APPENDIX I - IDENTIFICATION OF A SAFETY CRITICAL COMPONENT



5. APPENDIX II - NON-EXHAUSTIVE LIST OF POSSIBLE FAILURE MODES AND FACTORS THAT COULD HAVE AN INFLUENCE ON THEM

The following is a list of possible failure modes and factors that could have an influence on them:

Failure modes:

- Cracking
- Fatigue
- Seizure

Factors that could have an influence on the failure modes:

- Wear
- Overloading
- Corrosion
- Shock loading
- Misuse
- Handling of the equipment
- Latent defects
- Power failure
- Control failure
- Misalignment
- Stability
- Material failure
- Collision

6. APPENDIX III - NON-EXHAUSTIVE LIST OF TYPICAL EXAMPLES OF LIFTING PLANT SCCS

- Crane load hook/nut assembly
- Anchorages for single load chain or ropes
- Direct acting hydraulic rams
- Hoist gearboxes
- Gearbox input/output shafts
- Hoist brakes
- Mobile crane slew locks
- Load limiting devices
- Lift door electro mechanical locks
- Overhoisting/lowering limiting devices

7. APPENDIX IV - non-exhaustive list of possible factors that could HAVE AN INFLUENCE ON the likelihood of failure of a SCC

The following factors could have an influence on the likelihood of failure of a SCC:

- Maintenance regime
- Usage – utilisation and duty cycle
- Change of use/configuration since last examination
- Operating environment
- Age of equipment and SCC
- Adequacy of operator training
- Historical data on:
 - Maintenance
 - Previous failures/incidents
 - Repairs to SCCs
 - Wear rates
 - Periodic thorough examinations/inspections and testing

8. APPENDIX V - ASSESSING THE INTEGRITY OF A SCC

