Eskom Generation	REFERENCE **GGP 0199**	REVISION **2**

DOCUMENT TYPE **PROCEDURE**	DATE **OCTOBER 2006**

TITLE **REVERSE ENGINEERING PROCEDURE**	PAGE **1** OF **16**

THIS DOCUMENT HAS BEEN SEEN AND ACCEPTED BY	COMPILED BY
All Cluster Managers All Power Station Managers All Engineering Managers All Maintenance Managers	**AM Xaba** **Generation Asset Management**

APPROVED BY	APPROVED BY	AUTHORIZED BY
JH Begg **Generation Technology Manager**	**P Steenkamp** **GM (Generation Technology & Assurance)**	**EN Matya** **MD (GD)**
Date	Date	16 October 2006 Date

REVISION	DESCRIPTION OF REVISIONS	APPROVAL	DATE
0	Original OPG 0175	ENM	Oct., 06
1	Amend reference numbers		
2	Amend processes and dept. names		

See page 3 for Contents

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	DATE OF LAST REVIEW **October 2006**
	DATE OF NEXT REVIEW **November,2008**
	NOTE — These dates can be changed without affecting the revision status of the document

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1.0 PURPOSE

This document sets responsibilities and describes the process for assessing the desirability of resorting to Reverse Engineering a component. It also shows how the process can be managed to ensure satisfactory financial, commercial, technical, legal and plant performance results.

2.0 SCOPE

2.1 This document

This procedure is applicable to all Business Units within the Generation Division and applies to all Reverse Engineering activities. It covers the pre-assessment phase to the stage where the modification control guideline can be applied.

2.2 Design bases example

A separate document, reference number GGG 0201, is a practical example of formulating a design basis for Reverse Engineering a centrifugal pump shaft. This document is intended to provide assistance in understanding a typical approach to Reverse Engineering.

3.0 WARNING

Reverse Engineering can jeopardise plant safety and reliability!

Even components that appear technically simple may have complex material compositions, heat treatment, manufacturing techniques or fulfil secondary purposes in a plant system which are not obvious from casual examination. Failure to identify these and other important features can result in premature component failure and severe consequential damage to plant items.

4.0 DEFINITIONS

4.1 Reverse Engineering

Is a process by which existing plant components can be reproduced without jeopardising original design requirements while still meeting operational performance criteria. It is normally necessary where procurement difficulties, obsolescence, long lead times or exorbitant costs exist.

Reverse Engineering does NOT address the need for modification or re-design of under-performing plant components.

4.2 Modification

Is a process by which existing plant systems, equipment, structures and components are modified such that their original design specification is changed. This includes changes to operating set points and replacement of plant components with equivalent components where these components require minor modifications. (Normally necessary when operational, maintenance or reliability difficulties are encountered.)

4.3 Feasibility Study

A general logical approach to assessing whether a project is viable or not.

4.4 User Need Catalyst

An event which prompts the user to identify that Reverse Engineering may be required.

5.0 REFERENCES

5.1	SABS/ISO 9000 Series	:	Codes of Practice of Quality Systems
5.2	GGG 1099	:	Classification Control Guide
5.3	GGG 1100	:	Modification Control Guide
5.4	GGG 1101	:	Design Control Guide
5.5	OPG 0159 – 05	:	Procurement Control Guide
5.6	GGG 1104	:	Deviation Control Guide
5.7	OPG 0159 – 20	:	Quality Assurance Guide
5.8	GGPP 0200	:	Reverse Engineering Policy
5.9	32/7	:	Corporate Directive for Quality Assurance
5.10	GGG 0201	:	Reverse Engineering Guideline
5.11	GGP 0186	:	Fossil And Peaking Generation Modification Impact Team (MIT), Terms of reference and Process

6.0 RESPONSIBILITIES

6.1 Business Unit Manager

Is responsible to ensure that any Reverse Engineering that is carried out at the Business Unit is properly authorised and steps are taken to evaluate the legal (especially copyright and statutory technical aspects), strategic, technical and commercial risks. Once a reverse engineering project is authorised, the Business Unit Manager is responsible for its successful implementation, completion and the subsequent performance of related plant.

6.2 Business Unit Engineering Manager

Is to coordinate and approve Reverse Engineering projects at the power station.

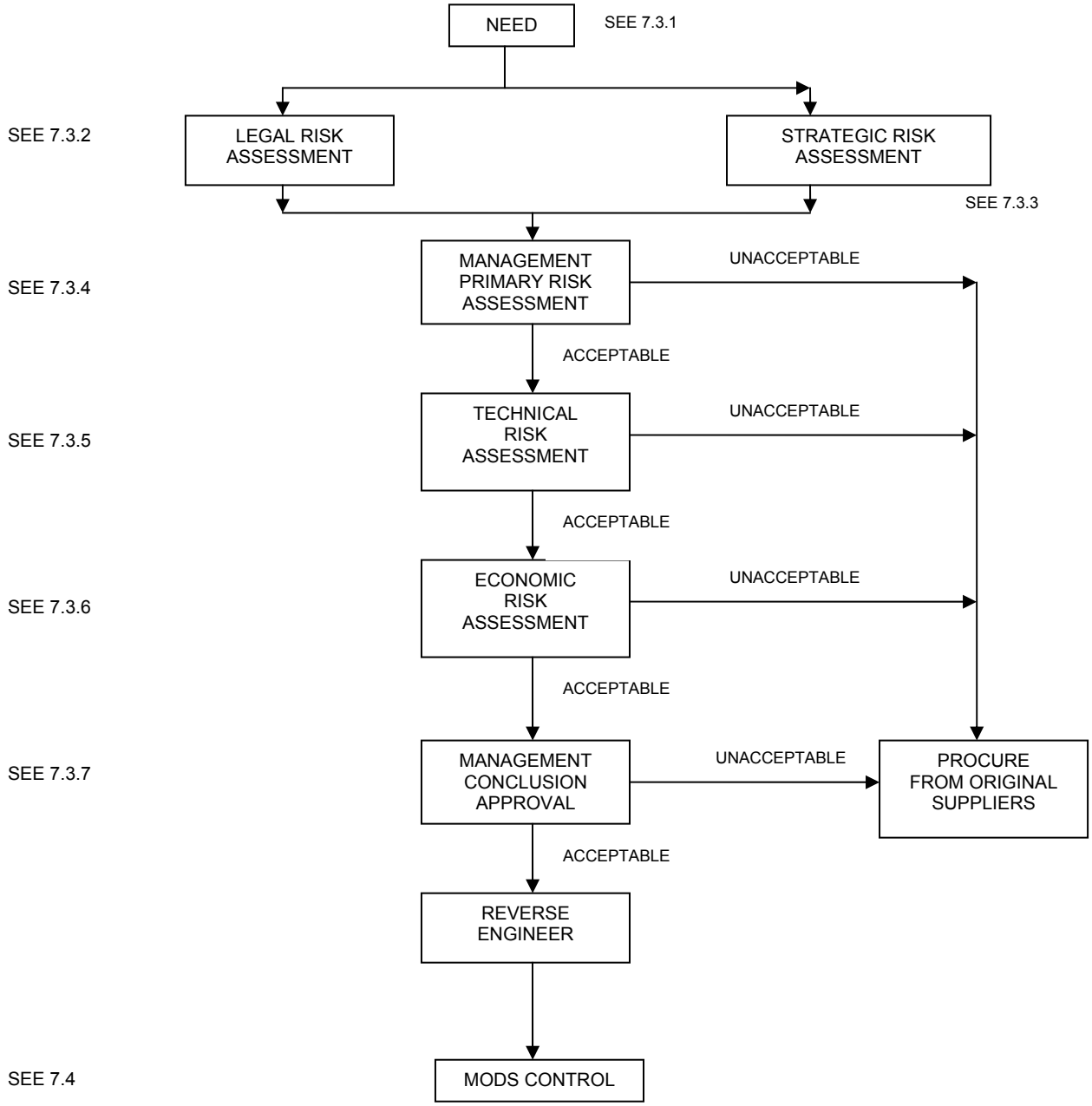
6.3 Generation Technology Manager

or delegated representative is responsible for

- Providing technical advice on the desirability of reverse engineering plant component;
- Restricting the reverse engineering of particular types of plant;
- Supplying specialised engineering support.

7.0 PROCESS

This flowchart depicts the Reverse Engineering process. Certain steps may be omitted depending on the nature of the product or component. The flowchart starts at the point where the Engineering Function has approved the need and appointed the Leader to proceed with the feasibility study.



7.1 Process Review

In order to ensure that all Reverse Engineering processes meet the defined Business Unit quality directive, the Lead Function shall compile a quality plan to control, assess and audit each step of the process. This plan, drawn up in conjunction with all Business Unit Engineering, Procurement, and Quality Assurance functions shall be in accordance with reference. Refer to checklist – Attachment 1.

7.2 Need and Project Initiation

For need initiation see flowchart 7.3.1. Although all Business Unit personnel can communicate a need to the Engineering Function, it is the Engineering Function's responsibility to register, co-ordinate and approve a Leader. This appointment will effect project initiation and start the feasibility study.

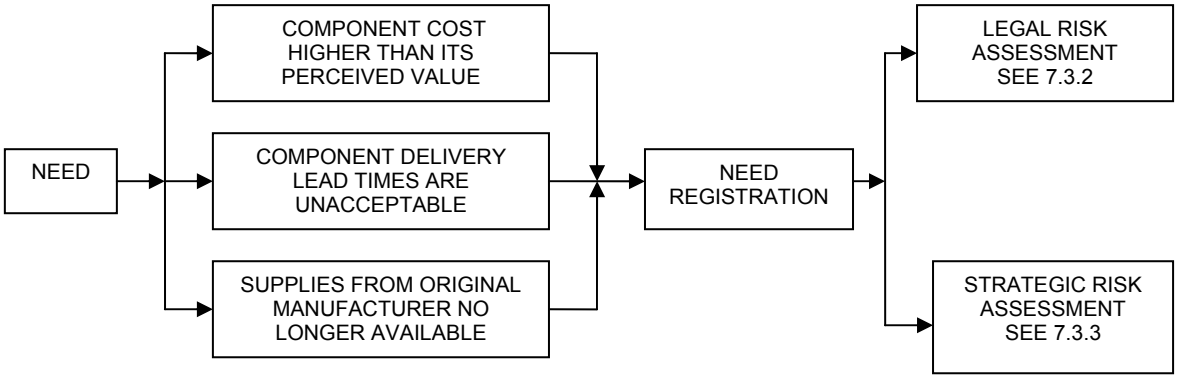
7.3 Feasibility Study

For the feasibility study Process see sections 7.3.1 to 7.3.7. The feasibility study is a method of ensuring that all Reverse Engineering projects undertaken limit Eskom's exposure to legal, strategic, technical and economic risks. The appointed leader either conducts the feasibility study himself/herself or ensures that a competent Design Function performs the technical analysis of the component with regard to classification, integrity, manufacturing techniques and consequences of failure. All relevant site and external functions should be consulted to contribute to the feasibility study process.

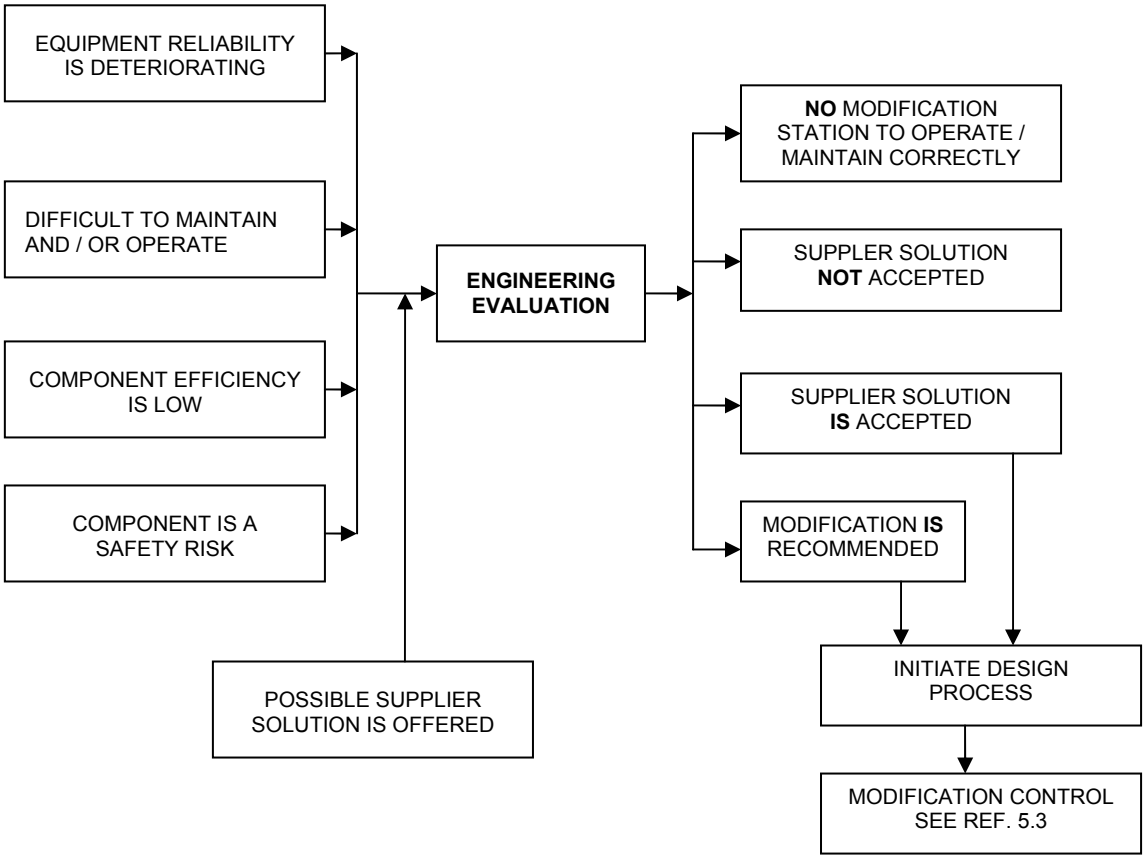
7.3.1 Feasibility Study Need Flowchart

Note : This flowchart depicts the difference between probable reverse engineering and modification needs.

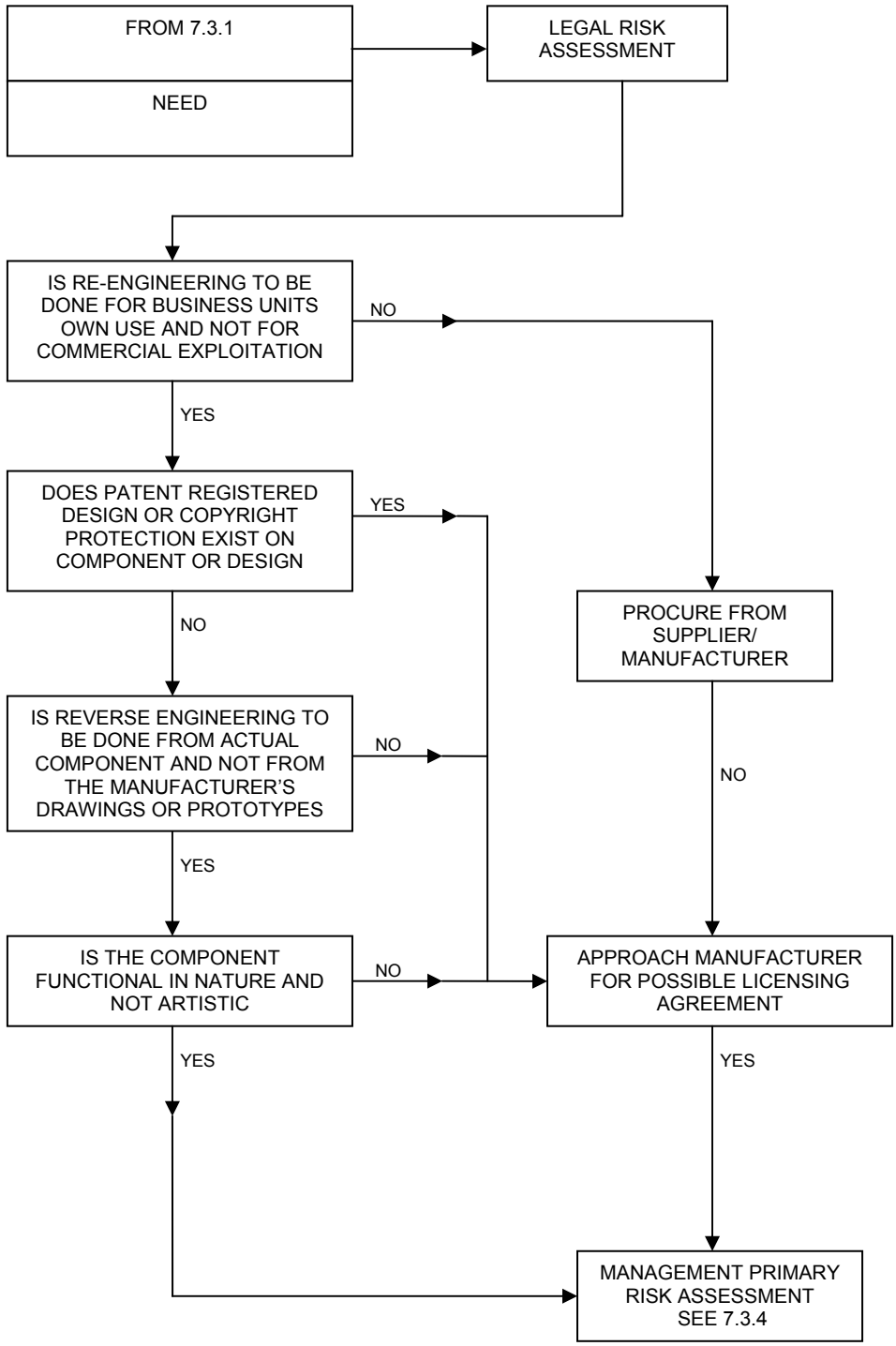
REVERSE ENGINEERING NEED



MODIFICATION NEED

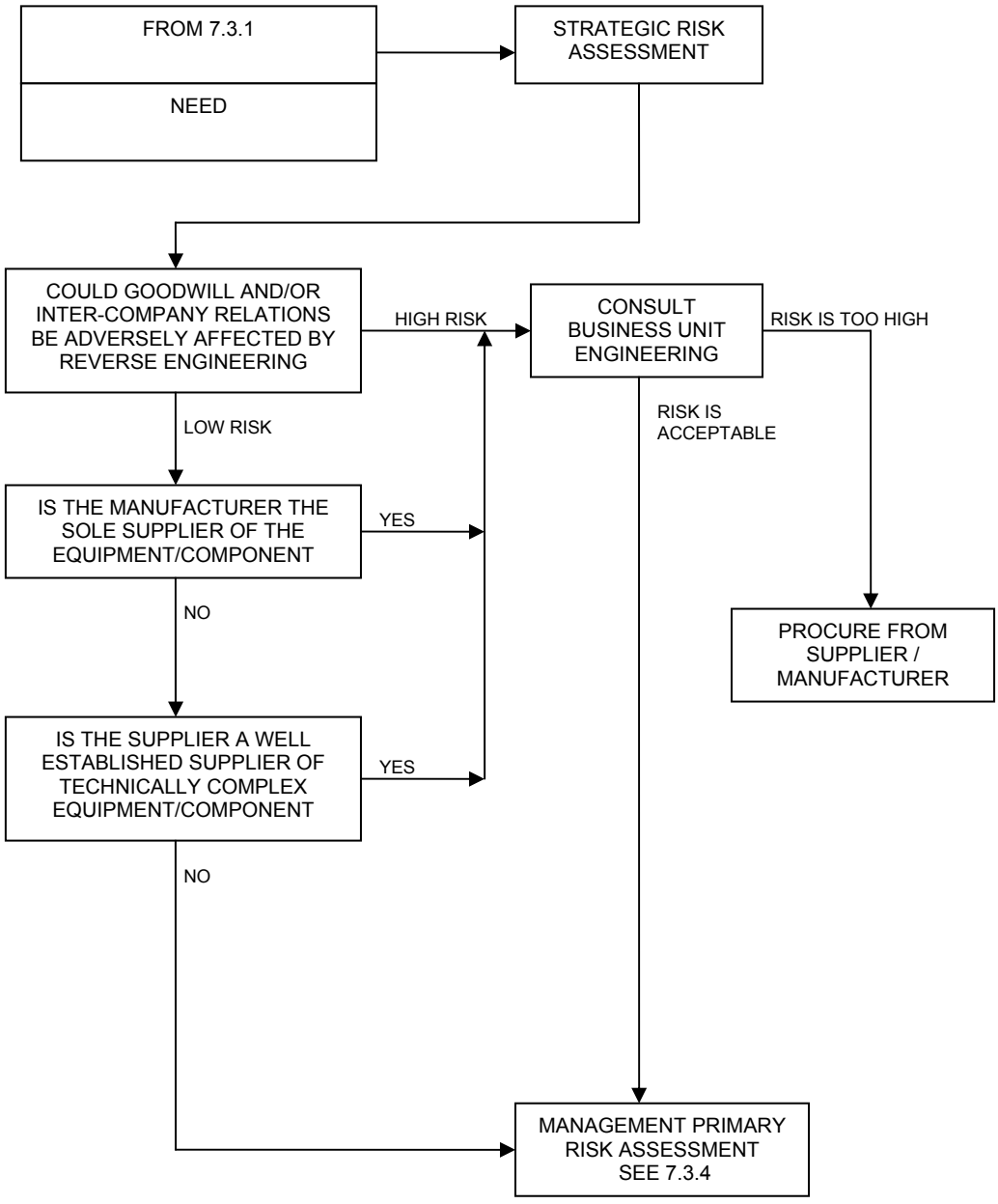


7.3.2 Feasibility Study
Legal Risk Assessment Flowchart



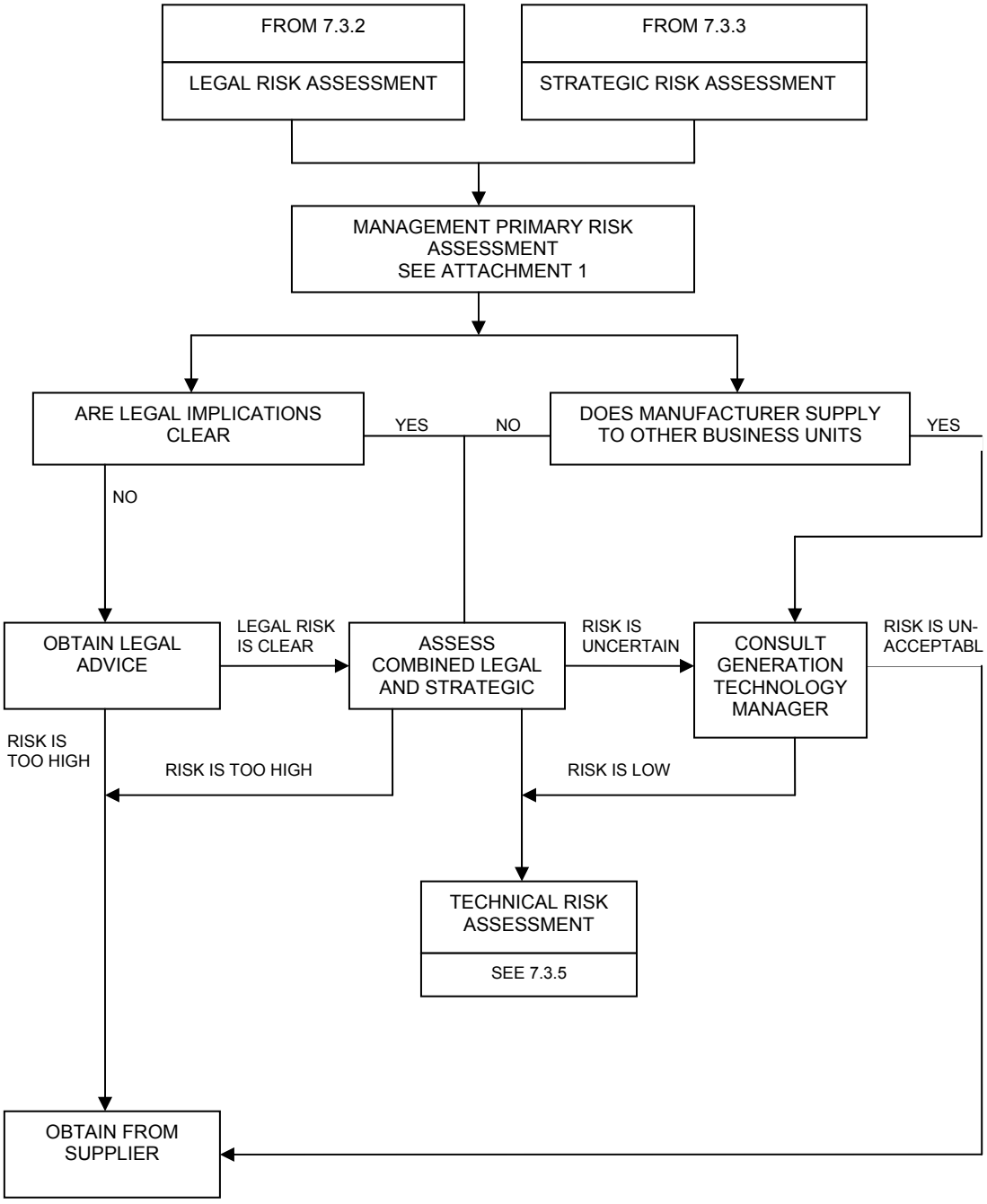
The purpose is to provide Business Unit Management with sufficient information to make a preliminary assessment of risk of exposure to copyright / patent litigation.

7.3.3 Feasibility Study
Strategic Risk Assessment Flowchart



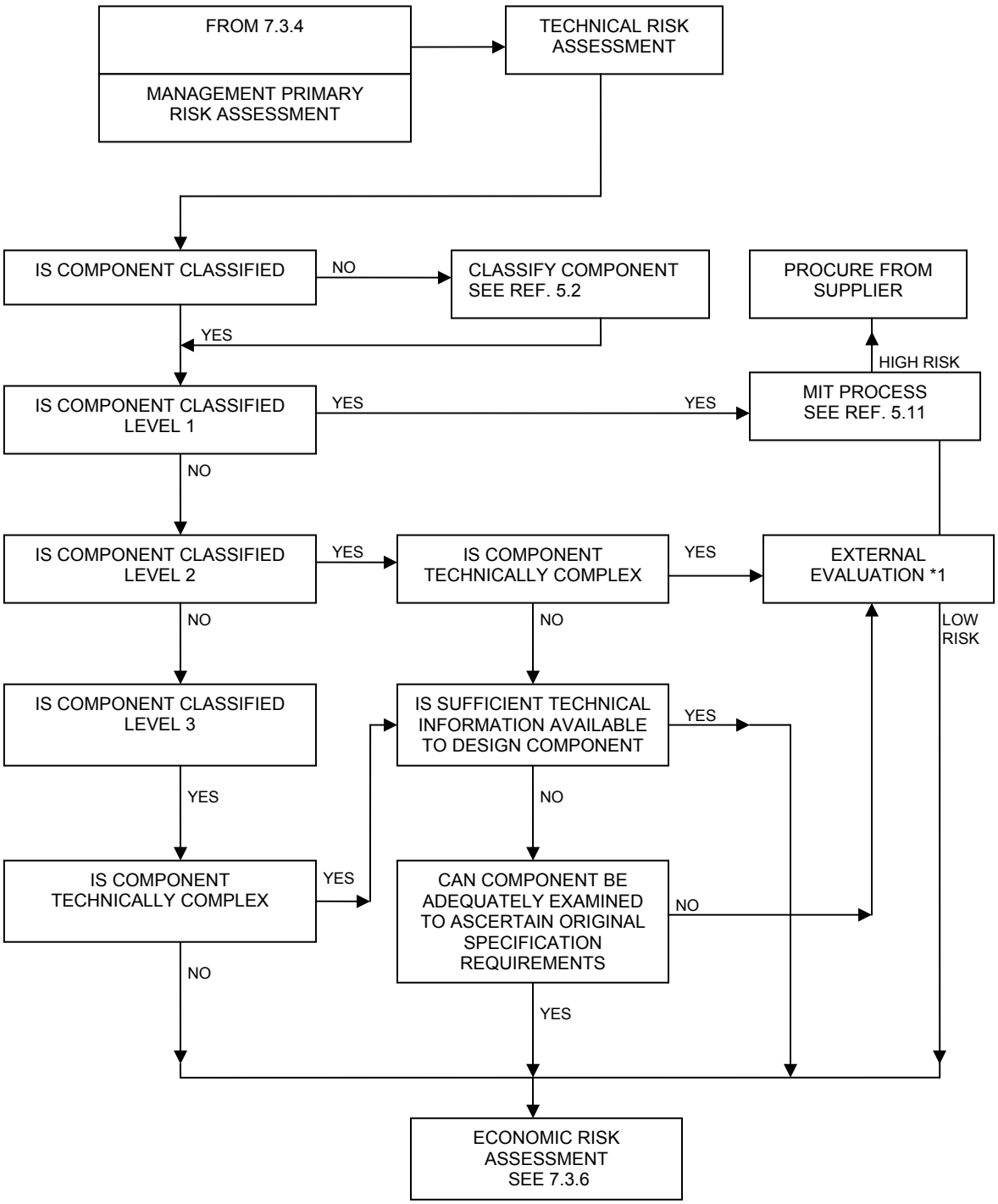
The purpose is to provide Business Unit Management with sufficient information to assess the strategic risks associated with inter company interfaces, long term goodwill and desired relationships, to make a preliminary assessment.

7.3.4 Feasibility Study
Management Primary Risk Assessment Flowchart



The purpose is this flowchart is to illustrate the preliminary management steps on deciding whether to reverse engineer or procure from the original supplier.

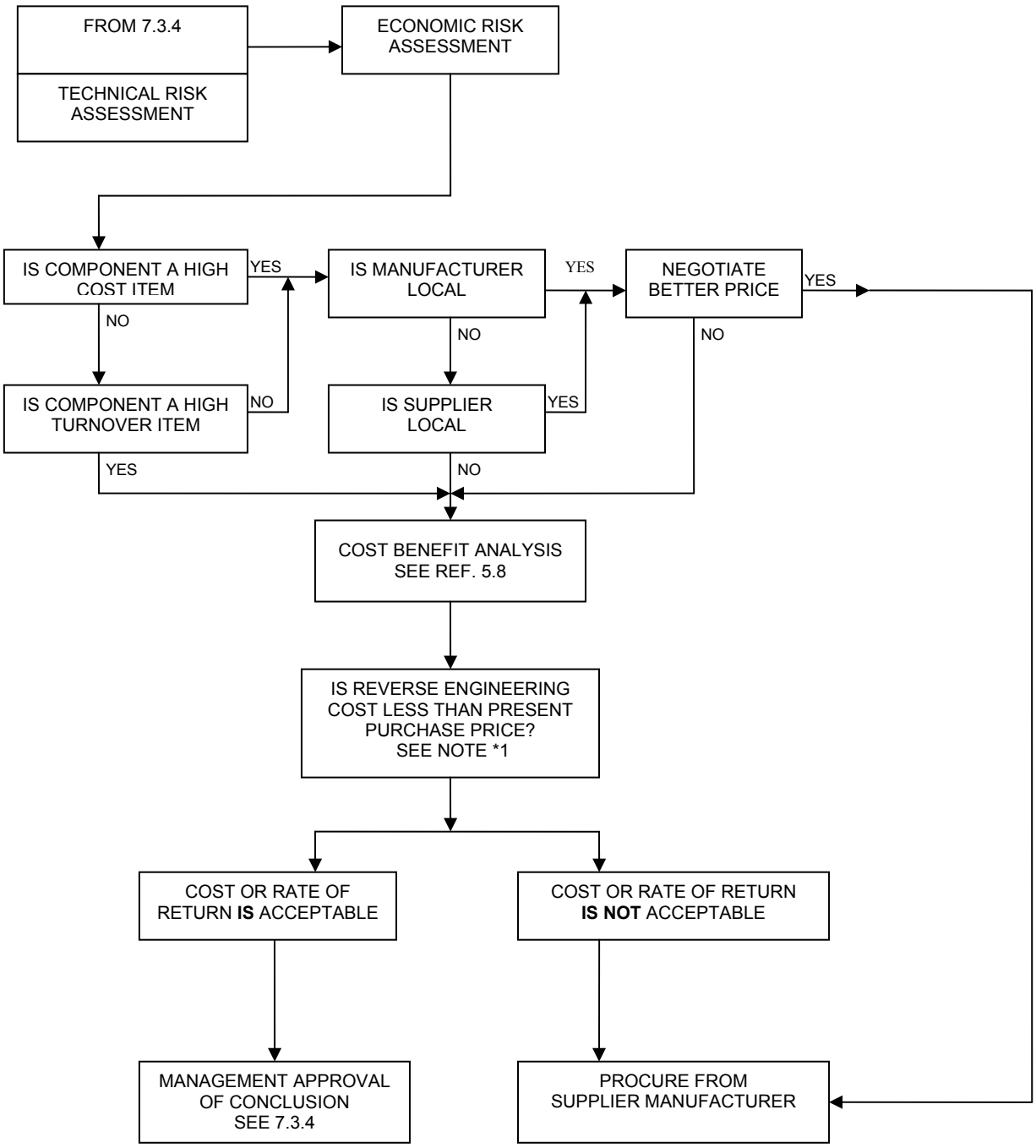
7.3.5 Feasibility Study
Technical Risk Assessment Flowchart



*1 : An external evaluation is required when in-house knowledge is insufficient to assess what would be required to reverse engineer a component. This evaluation can be undertaken by specialised functions of Eskom or by outside companies.

The purpose of this assessment is to provide a report to Business Unit Management which determines the criticality of the system in which the component functions and whether the nature of the component is compatible with a manufacturing process available to Eskom.

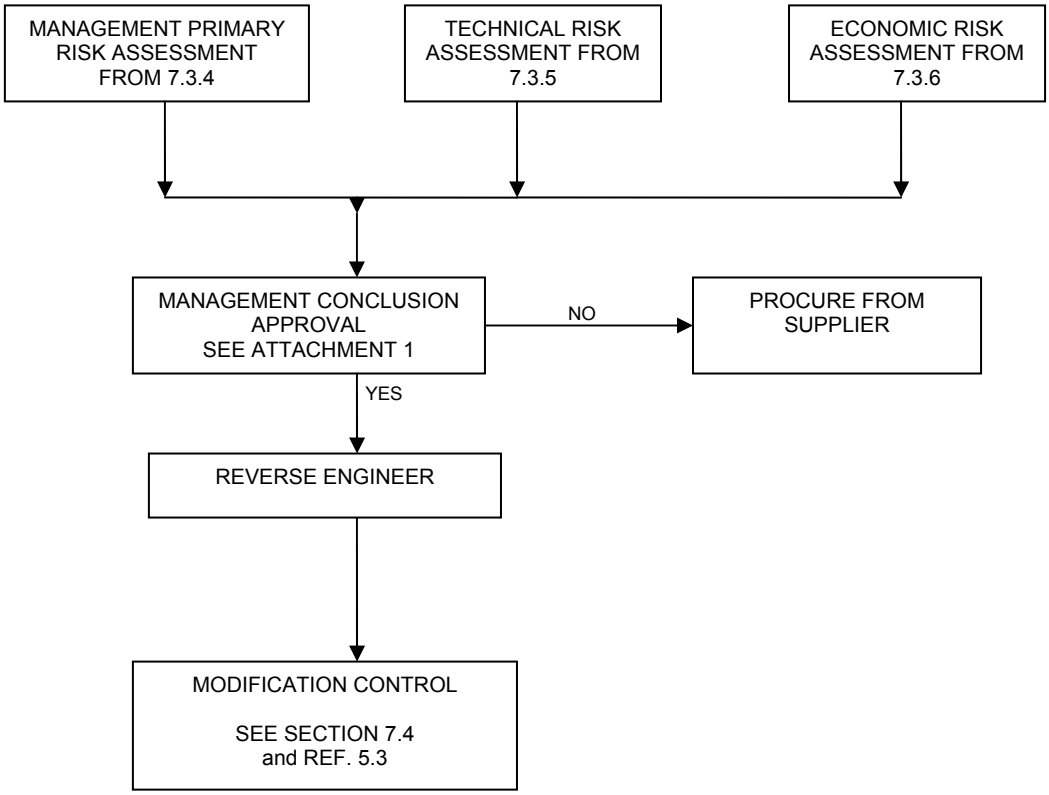
7.3.6 Feasibility Study
Economic Risk Assessment Flowchart



The purpose is to provide a report to Business Unit Management to compare the cost of reverse engineering a component against the prices quoted by the OEM.

*1 : Cost factors to be taken into account when ascertaining initial cost are: design, manufacture, procurement, quality assurance, stock holding, lead times for delivery and configuration control.

7.3.7 Feasibility Study
Management Approval of Conclusion Flowchart



The purpose is for Business Unit Management to authorize or decline resorting to reverse engineering for the particular component.

7.4 MODIFICATION CONTROL

If the feasibility study provides Business Unit Management with sufficient confidence to adopt Reverse Engineering, then to ensure system integrity the component shall be subjected to the Modification Control process in accordance with reference 5.3.

8.0 DOCUMENT AVAILABILITY

This document can be accessed electronically via the Eskom Intranet and the FTR system.

ATTACHEMENT 1

MANAGEMENT PRIMARY RISK VERIFICATION AND REVIEW CHECKLIST

1. MANAGEMENT PRIMARY RISK ASSEMENT

		NAME	SIGNATURE	DATE
1.1	Lead Function	……..		
1.2	Legal risk assessment completed by	……..		
1.3	Strategic risk assessment completed by	……..		
1.4	Reviewed by	……..		
1.5	Management : Authorised by	……..		
1.6	Technical risk assessment by	……..		
1.7	Economic risk assessment by	……..		

2. FUNCTION INVOLVEMENT

2.1	Quality Assurance	……..
2.2	Other	……..
2.3	Other	……..
2.4	Other	……..
2.5	Other	……..

3. MANAGEMENT – CONCLUSION APPROVAL

3.1	Approved by	……..
3.2	Approved by	……..

4. MANAGEMENT RECOMMENDATION ……..

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