1.0 Purpose

1.1 To describe the formal method of hazard identification, risk assessment, risk control and documentation to effectively manage hazards that may occur.

2.0 Scope

2.1 This procedure applies to all Redox sites in Australia and New Zealand.

2.2 Hazard identification, assessment and control are an on-going process. It must be undertaken at various times, including:

a) If it was not been done previously

b) On an annual basis (at least)

c) Where new information about a hazard or risk becomes available or concerns about a hazard or risk are raised by workers

d) When a hazard has been identified

e) When a process change has occurred

f) When new equipment or machinery has been implemented

g) After an incident or accident

h) Prior to completing any hazardous work such as:

i) Entry into Confined spaces

ii) Conducting Hot work

3.0 References

3.1 Work Health and Safety Act and Regulations (NSW, QLD and SA)

3.2 Occupational Health and Safety Act and Regulations (VIC and WA))

3.3 How to Manage Work Health and Safety Risks Code of Practice – Safe Work Australia 2011

3.4 How to Determine What is Reasonably Practicable to Meet a Health and Safety Duty – Safe Work Australia – 2013.

3.5 Managing Risks of Hazardous Chemicals in the Workplace Code of Practice – Safe Work Australia 2011

3.6 Control of Major Hazard Facilities - National Standard [NOHSC:1014(2002)] & National Code of Practice [NOHSC:2016(1996)]

3.7 New Zealand Health and Safety Act 1992

3.8 PACIA Responsible Care Codes of Practice

3.9 Procedure 1016 – Process Change Management

3.10 Procedure 3011 – Corrective & Preventative Actions

3.11 Procedure 3017 – Internal Audits

3.12 Procedure 3026 – Process & Change Management System

3.13 Procedure 3112 – Safe Work Permit

3.14 Procedure 3119 – Occupational Health & Safety Consultation

3.15 Procedure 3414 – Food Safety Management System (HACCP)

3.16 Procedure 3880 – Safety Management System

3.17 Procedure 3881 – Safety Management System (MHF)

3.18 Procedure 3890 – Threshold Quantities

4.0 Definitions

4.1 Hazard – a situation or thing that has the potential to harm a person. Hazards at work may include: noisy machinery, a moving forklift, chemicals, electricity, working at heights, a repetitive job, bullying and violence at the workplace.

4.2 Risk – The likelihood and consequence that a hazardous event will occur.

4.3 Consequence – The specific result of an event occurring.

4.4 Likelihood – The chance of the consequences of an event occurring.

4.5 Major Hazard Facility (MHF) – Sites where large quantities of **hazardous** materials are stored, handled or processed. These sites are required to have a specific accreditation. Currently only the Dry Creek (Adelaide) site has MHF accreditation.

4.6 Management – Redox Board of Directors

4.7 Major Incident (MI) – Results from an uncontrolled event at the major hazard facility involving, or potentially involving, Schedule 15 chemicals (WHS Regulations) and exposes a person to a serious risk to health or safety emanating from an immediate or imminent exposure to the occurrence

4.8 Reasonably Practicable – that which is, or was at a particular time, reasonably able to be done to ensure health and safety, taking into account and weighing up all relevant matters including: likelihood of the hazard or the risk concerned occurring, the degree of harm that might result from the hazard or the risk, what the person concerned knows, or ought reasonably to know, about the hazard or risk, and about the ways of eliminating or minimising the risk, the availability and suitability of ways to eliminate or minimise the risk and after assessing the extent of the risk and the available ways of eliminating or minimising the risk, the cost associated with available ways of eliminating or minimising the risk, including whether the cost is grossly disproportionate to the risk.

4.9 Worker – A person who carries out work in any capacity for Redox including work as an: Employee, Contractor or Sub-Contractor, Employee of a labour hire company who has been assigned to work at Redox, Outworker, Apprentice or Trainee, Student gaining work experience or Volunteer.

5.0 Procedure

5.1 Responsibility and Authority

Management are responsible for understanding the nature of the operations of the business and generally of the hazards and risks associated with those operations, ensuring hazards are identified and risks are assessed, controlled and evaluated (where reasonably practicable) and that the health and safety of workers is not put at risk from work carried out as part of the conduct of the business.

The Branch/Department Manager is responsible and has the authority to ensure that staff at within their branch or department comply with this procedure.

Redox workers (including contractors) are responsible for acting in accordance with this procedure.

The Internal Auditor is responsible and authorised to review and audit this Procedure as per Procedure 3017 – Internal Audits.

The Branch/Department Manager or Risk Team, for each Redox site is responsible for carrying out the tasks described in this procedure. Where reasonably practicable, the tasks will be completed in consultation with all Redox employees within the site.

The Risk Team at each site will consist of the Branch Manager, Warehouse/Plant Manager, HSR and/or WHS Representatives (where appropriate).

5.2 Identify the Hazards

All workers are responsible for reporting any hazard identified to their Supervisor or Manager. The Supervisor or Manager will then report the hazard to the Branch Manager and/or member of the Risk Team for review.

Branch/Department Managers and the Risk Team shall conduct a hazard analysis when required to assess the risk associated with a hazard and implement any controls (if reasonably practicable).

A hazard is a source of potential harm or a situation with the potential to cause harm. When identifying hazards, the following must be taken into consideration:

a) The workplace environment – Temperature, size of site, number of staff and shifts.

b) Workplace layout, design and organisation – How have the warehouses and plants been designed and laid out and how are products, tanks and racking positioned around the site.

c) Design of equipment – How has racking and tanks been designed and by whom. Does it meet Australian or International Standards?

d) How equipment is installed and disposed – How has pallet racking, tanks and forklifts been installed, commissioned and disposed of.

e) Management systems and procedures – Are all procedures valid, correct and current and are staff aware of these procedures.

f) Human Behaviour – Effect of fatigue and horseplay on operations.

g) Emergency Situations – What affect will emergencies such as storms, fires or explosions have on operations?

h) Contractors involved in work practices – What task/process are contractors conducting and what training do they have.

i) Training – Have all staff been trained in the operation of equipment or how to complete a task.

j) How often equipment is inspected and repaired – Is equipment being inspected in accordance with manufacturer specifications?

k) Changes in processes or equipment – Have the changes been rolled out effectively and are all workers aware of the changes.

Numerous methods and sources of information can be used to identify Hazards associated with Redox operations;

l) Site Inspections

m) Interviewing workers

n) Information from contractors.

o) Information from suppliers and customers e.g. SDS

p) Reports published by Regulatory Bodies and Education Institutes

q) Information from PACIA or other industry bodies.

r) Manufacturer specifications and user guides

s) Australian/New Zealand Standards

t) Previous safety incidents or near misses

u) Incident and near miss reports

v) Codes of Practices published by regulatory bodies (such as *Managing Hazardous Chemicals in the workplace*)

Once the hazards have been identified, they need to be recorded in form 21190 – Hazard Inspection Form.

5.3 Likelihood and Consequence

For each hazard identified, the Branch, Department Manager and Risk Team shall determine the likelihood and consequence of each Hazard or hazardous event. When determining likelihood and consequence, the following needs to be taken into consideration:

a) Whether there are any other risk factors that increase the likelihood of exposure or consequence?

b) How often the person is exposed (frequency)?

c) For how long is the person exposed (duration)?

d) How many people are exposed?

e) Nature of product (corrosive, flammable, toxic, etc)

f) Nature of task (manual handling, lifting, etc)

g) The likely dose to which the person is exposed?

h) Method of exposure (skin, mouth, eyes, etc)?

i) What is the worst thing that could happen if the hazard occurs?

j) Any legislative or recommended exposure levels required by statutory authorities.

5.4 Assess the Risks

The Branch, Department Manager and Risk Team shall assess the risks that are likely to affect Redox objectives and activities and how likely it is that someone could be harmed by the hazard as well as what is the consequence. This should include:

a) Identify factors that may be contributing to the risk

b) Review health and safety information that is available from Authorities which is relevant to the particular hazard.

c) Evaluate the likelihood of hazard occurring and the likely severity of its occurrence.

d) Identify the actions necessary to eliminate or control the risk

e) Identify the records necessary to keep to ensure that the risks are eliminated or controlled.

Other risk factors should also be identified as they contribute to the risk including:

f) The facilities (including equipment such as mix and storage tanks) and the working environment, including its layout and condition.

g) The capability, skill and experience of people undertaking work.

h) Atmospheric conditions such as high levels of chemical vapours.

i) The systems of work being used.

The Risk Assessment and Evaluation (including Risk Matrix) for Work Health and Safety is available on Form 21121 Risk Assessment and Evaluation. The Matrix provides a calculation based on 'likelihood x consequence', the calculation will provide guidance on the significance and criticality of each identified risk.

Process and Change Control Management

Workers identifying hazards and risks associated with process change must complete Form 21128 – Process and Change Control Request Form (PCR) according to Procedure 3026.

5.5 Risk Evaluation

After the risk assessment has been conducted, each risk is given a ranking from Very Low (light Green) to Critical (Red). Guidance on what each ranking means is detailed in the table within this document (under heading definition) In determining additional controls, staff need to refer to section 5.7 of this procedure.

5.6 Amendments to SDS

Any Control Measures implemented to reduce the risk associated with a particular chemical will be reviewed by the SDS clerk when a new chemical is introduced or an SDS is amended. If any changes are required to be made to control measures, the following staff will be notified:

a) Warehouse: Changes to storage, handling or preservation controls.

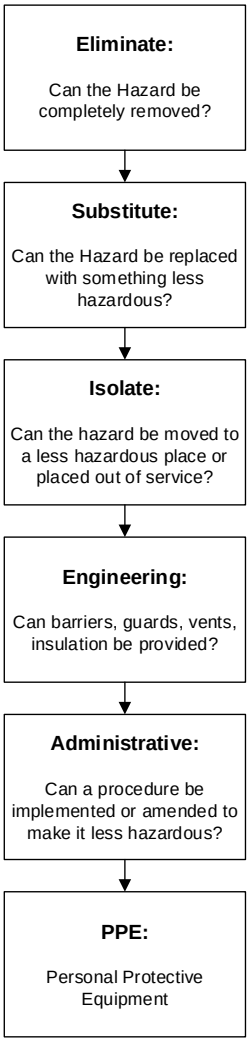
b) Sales and Product Managers: Changes to storage, handling or preservation controls (for customers).

5.7 Risk Controls

The primary objective of the Hazard identification and risk assessment is to eliminate or reduce the risk associated with the hazards so far as it is 'reasonably practicable'. This means all relevant matters must be taken into account and weighed up and a balance achieved that will provide the highest level of protection that is both possible and reasonable in the circumstances.

When implementing Corrective actions/controls, the Branch/Department Manager and Risk Team must follow the "Hierarchy of Controls". The methods of controlling risks are ranked from the highest level of protection and reliability to the lowest.

The Branch/Department Manager and Risk Team must attempt to implement corrective actions/controls at the highest level (elimination of the hazard); if the highest level of control is not practicable, they must work their way down the hierarchy.



A QP will be raised in Redebiz for all hazards that have been identified and require corrective Risk control measures to be implemented. The QPs must be actioned in accordance with Procedure 3011 - Corrective & Preventative Action. The QP will be owned by the Human Resources Manager, Branch Manager or member of the Risk Team. Controls implemented may include improvements to:

a) Design or layout of equipment or structure,

b) Replacing Hazard with something less hazardous

c) Engineering controls.

d) Administrative controls such as procedural amendments,

e) Personal protective equipment (PPE).

5.8 Monitor and Review

Any controls implemented must be reviewed at regular intervals by the Manager of the branch or department where the hazard is present. The first review must be conducted three months after the control has been implemented. The results of these reviews must be submitted to the Human Resources Manager, Branch Manager or Risk Team and recorded on form 21190.

If corrective action/control measures are not implemented, deemed unsatisfactory or unsuccessful; the Human Resources Manager will review the situation and either:

a) Reassess the Risk

b) Look at other control measures

c) Refer to the Board of Directors for review

Internal auditing of all the hazard identification assessments and controls shall be undertaking at planned intervals in accordance with Procedure 3017 – Internal Audits.

For any change that occurs to any service or process of Redox, a hazard assessment must be completed as per Procedure 3026.

5.9 Consultation

The Branch Manager, Human Resources Manager, WHS Representatives and/or HSRs shall ensure that workers are consulted through the processes described in this procedure (from identification to assessment and control). Consultation must take place in accordance with procedure 3119 – Work Health and Safety Consultation.

5.10 Major Hazard Facilities (MHF)

Sites with Major Hazard Facility (MHF) accreditation need to conduct an additional hazard analysis and risk assessment in accordance with section 9 of WHS Regulations. The aim of this hazard analysis and risk assessment is to identify, assess and control 'major incidents' which could occur at the site.

5.10.1 MHF Team

When a Redox site is proceeding with MHF accreditation, a MHF team must be established who will identify major incident and incident hazards and develop a Safety Case.

The MHF team will consist of: Branch Manager, Warehouse Manager and other specialist staff who can such as Chemist, Regulatory Affairs Coordinator, Logistics Manager, Quality Assurance Manager and Internal Auditor.

Selection of staff for the MHF team will be based on: Product and process knowledge, Work Health and Safety knowledge and experience, Chemistry training and experience and Site knowledge. External consultants with specialist knowledge may also be selected for the team (such as chemical engineers).

5.10.2 What Is A Major Incident

A Major Incident is an occurrence that:

a) results from an uncontrolled event at the major hazard facility involving, or potentially involving, Schedule 15 chemicals

b) Exposes a person to a serious risk to health or safety emanating from an immediate or imminent exposure to the occurrence.

5.10.3 Major Incident Identification

In addition to the items outlined in sections 5.1-5.10. The MHF team must identify:

a) All major incidents that could occur in the course of the operation of the major hazard facility (The focus is on high consequence/low frequency incidents).

b) All major incident hazards for the major hazard facility, including major incident hazards relating to the security of the major hazard facility.

In order to identify major incidents and major incident hazards applicable to an MHF site, the MHF team must undertake the following steps:

5.10.3.1 Identify and Select all Schedule 15 chemicals

Refer to schedule 15 of WHS Regulations and determine which chemicals are stored on site and in what quantities (this information can be obtained from Redebiz).

a) **Understand the chemical properties and how the schedule 15 chemicals stored on site could cause harm:** This information can be obtained from SDSs, product specifications, Australian Standards, Suppliers, Industry publications and results of testing. It is important that the chemical properties can be **interpreted and understood**, Therefore it is strongly advised that someone (internally or externally) with chemistry training and experience is on the MHF team, as they will probably have a better understanding of this information.

b) **Research previous major incidents and near misses:** This information can be obtained from site and industry history, organisation near miss and incident reports, industry publications and Safe Work Australia.

c) **Identify the Major Incident and Major Incident Pathways:** Identification of the major incident hazards and the potential major incidents they may require some creativity, technical expertise, and familiarity with the plant and equipment. It is important that the MHF team consider the following: what constitutes a major incident, the properties of schedule 15 chemicals, how the chemicals are used, plant and industry incident history and feedback from Emergency Service Organisations and Government departments.

5.10.3.2 Identify Uncontrolled Events

For each major incident identified, the team will need to determine the 'uncontrolled' event(s) that could occur as a result of the major incident. This includes events such as package leaks, spills or fire. An uncontrolled event is one which is unplanned and/or involving the failure of one or more controls. The team must consider the potential uncontrolled events from the failure of a control (or multiple controls). This includes uncontrolled events which result from failure of firefighting systems, inadequate maintenance and failure of equipment.

5.10.3.3 Identify Causes

The potential cause of each major incident needs to be identified. This involves identifying event(s) or situation(s) which could result in a major incident occurring. It is important that that

more than one event or situation could cause a major incident and that these causes aren't always apparent. Consultation with staff will help identifying potential causes of major incidents.

5.10.3.4 Define Consequences

The potential onsite and offsite consequence of each major incident must be identified.

It is important that the team challenge assumptions and existing norms and design of operation; think beyond the immediate experience of the facility and look only at the potential and ignore any consideration of likelihood or existing controls (at the stage). Recognise that existing controls and procedures cannot always be guaranteed to work as expected and learn lessons from similar organisations and businesses. Further detail on how to identify hazards is located under section 5.2.

5.10.4 Refine The Major Incident List

All identified major incident hazards with a scientifically credible mechanism linking it to a major incident should be included. If the mechanism cannot be established then the incident can safely be removed from further consideration. This is not the same as establishing a very low likelihood.

Once a list of Major incidents has been developed, they should be submitted to the local Emergency Services Organisation (i.e. fire brigade or police) and local government office and/or Environmental Protection Agency (EPA) for review and comment.

The list of major incidents and pathways must be recorded on form 21190 – Hazard Inspection form.

5.10.5 Safety Assessment

5.10.5.1 Consequence Analysis (with and without controls)

The MHF team must identify the worst consequence of all major incidents **both with and without controls in place**. When determining the consequence of a major incident or the following needs to be considered:

a) Magnitude: The size scale of the effect zone created by the incident, within which a number of injuries or fatalities or extent of property damage could arise.

b) Severity: The actual level of injury that could occur or damage caused.

An Assessment of the possible outcomes needs to include consideration of what may go wrong if measures to eliminate or prevent incidents are not present, are wrongly implemented or fail to function. The team need to also consider potential for one event to potentially trigger another event or major incident. Consequences of major incidents can be determined/estimated by referring all or some of the below:

c) Previous internal incident and investigation reports and Lost Time due to injury (LTI) data.

d) Incident and investigation reports on major incidents published by regulatory bodies.

e) Safety Data Sheets.

f) Studies on potential incidents released by industry bodies, educational facilities and regulatory bodies.

g) Consequence modelling (with and without controls): i.e. Pool Fire Assessments and Explosion, fire and smoke modelling.

h) Sensitivity Analysis – Analysis which provides guidance on factors which are important and how the consequence severity varies with variation in those factors.

Assistance in determining the consequence of a risk can also be found in form 21121 (Risk Assessment and Evaluation).

5.10.5.2 Likelihood Analysis (with and without controls)

The likelihood of each major incident occurring (**with and without controls in place)** must be analysed by the MHF team. The likelihood of a major incident occurring depends on the likelihood of the initiating event and effectiveness of controls. Effectiveness is a measure of how well the control measure performs, or is likely to perform if required. An assessment of effectiveness may include:

a) Functionality: ability of control to address a particular hazard

b) Reliability: whether control will be functional when/if required

c) Independence: control is not dependent on other controls functioning

d) Maintenance: whether control functionality can be maintained (e.g. availability of parts, access, training and knowledge)

e) Monitoring: whether it is possible to monitor that the control is fully functional or impaired, and how this could be done.

The likelihood of a major incident **without** controls must also be assessed**.** The likelihood of a major incident occurring can be determined by reviewing the data/documents and records outlined in step 5.3.

Once the likelihood of a major incident has been determined (with and without controls), it needs to be recorded in form 21190 – Hazard Inspection form.

Assistance in determining the likelihood of a risk can also be found in form 21121 (Risk Assessment and Evaluation).

5.10.5.3 Assessment of Risks

An assessment of each risk must be conducted using the Risk Assessment and Evaluation form (form 21121). The matrix provides a risk calculation based on the **consequence and likelihood** of each identified risk. The calculation assists in evaluating the overall significance and criticality of each risk and whether additional controls are required (refer to next section on risk evaluation).

5.10.5.4 Risk Evaluation

The table below details the risk calculations (obtained from the risk matrix) and if additional controls are required.

Risk Calculation	Controls needed
Critical (Red)	further controls need to be found or continued operation questioned
High (Dark Orange)	further controls need to be found or continued operation questioned
Moderate (Yellow)	further risk reduction controls to be investigated seriously
Low (Light Green)	further risk reduction is

	probably impracticable
Insignificant (Dark Green)	further risk reduction is probably impracticable

Once risks have been evaluated, the evaluation needs to be recorded on form 21190 – Hazard Inspection form.

5.10.6 Risk Control

The MHF team must implement controls in accordance with the 'Hierarchy of Controls' (refer to flow diagram in section 5.8 of procedure). The aim of risk control is to eliminate the risk of a major incident occurring, its magnitude and the severity of its consequences to persons both on-site and off-site (as far as it is reasonably practicable). If it is not reasonably practicable to eliminate that risk, the team must follow the hierarchy of controls until adequate controls can be found.

When determining controls, the team must demonstrate that the identified controls are adequate.

5.10.6.1 Identification of Controls (Existing):

The MHF team will identify existing controls which are used to eliminate or reduce the risk associated with a major incident (as far as reasonably practicable). Existing controls are identified by reviewing current Redox Policies, Procedures and Processes, consulting with staff and observing processes being conducted. The controls identified must be recorded in form 21190 – Hazard Inspection Form.

5.10.6.2 Demonstrating Adequacy of Controls

All controls implemented must be able to demonstrate adequacy. To do this, controls must show the following:

a) the control measures in place are capable of reducing the risk posed by each hazard so far as is reasonably practicable

b) It is not reasonably practicable to use more or better control measures to reduce risk further (i.e. the hierarchy of controls has been followed).

c) The control measures in place perform their intended function effectively and reliably

d) Shows layers of protection commensurate with the inherent level of risk posed by the major incident

e) An SMS is in place that works to ensure that all control measures will continue to perform effectively whenever needed.

Demonstrations of control adequacy are detailed in the Safety Case.

5.10.6.3 Consider Potential Additional Controls

Depending on the outcomes of the adequacy review and Risk evaluation, additional controls may need to be implemented. Any additional controls will need to demonstrate adequacy. In order to determine what additional controls will need to be implemented, the team should refer to the following resources:

a) Performance Standards

b) Manufacturing and supplier standards and guides

c) Australian and International Standards

d) Industry experience and processes

e) Regulatory and educational publications

f) Incident Investigation reports

g) Consult with staff.

5.10.6.4 Bow-Tie Diagrams

For each major incident identified by the MHF team, a bow tie diagram needs to be created detailing:

a) Hazard which could cause major incident (E.g. dropped container).

b) Current controls in place to eliminate and/or reduce risk.

c) Major incident event (e.g. Uncontrolled event involving Xanthates)

d) Consequence of major incident event (e.g. Potential for spontaneous combustion leading to fire)

e) Mitigation control (controls used mitigate effect of major incident)

5.10.7 Critical Controls

These are control measures that significantly reduce or eliminate the likelihood of the hazard or reduce the severity of consequences. For each Critical Control that is identified, Performance Monitoring needs to be established.

Performance Monitoring

For each Critical Control Identified, performance standards and indicators must be established. Performance Indicators are used to identify items which indicate the effectiveness of a control measure. Performance standards are used to detail what parameters must be met in order to determine if the control is effective or working.

The MHF team must also set up methods for validating that the critical control is working. Validation can be in the form of regular document and record reviews, audits and inspections.

Corrective actions must be implemented in the event that a control measure is not effective or isn't working.

5.10.8 Review Of Risk Management

The MHF Risk Assessment will be reviewed in accordance with the following schedule:

a) Safety Assessment: Once every two years

b) Emergency Plan: Once a year

c) Safety Management System: Once a year

Regardless of the timeframes mentioned above, each document will also be reviewed when:

d) A modification to the facility is proposed

e) A control measure implemented does not minimise the relevant risk so far as reasonably practicable

f) A new major hazard is identified

g) Results of consultation indicate that a review is necessary

h) The regulator requires a review to be conducted.

i) A health and Safety Representative requests a review

6.0 Documentation

6.1 Form 21093 - Risk Assessment Calculations

6.2 Form 21121 - Risk Assessment & Evaluation

6.3 Form 21128 - Process and Change Control Request (PCR)

6.4 Form 21129 - Hazard identification and Risk Assessment Form

6.5 Form 21190 - Hazard Inspection Form

6.6 Form 21226 - HACCP Worksheet 1: Food Safety Hazard Analysis

7.0 Procedure Responsibility

7.1 Refer Review/Approval status.

8.0 Summary of Changes

8.1	29-Aug-05	Initial issue.
8.2	09-Dec-05	Amended address in 4.3a from Wetherill Park to Minto.
8.3	20-Dec-06	Various amendments throughout the procedure.
8.4	30-Jan-08	Added SA and WA to 5.2.1 and added SA to 5.4.1.
8.5	26-Mar-10	Added reference to Procedure 0402 to section 4.3. Removed reference to Forms 21141 & 21142 and added Form 21110. Replaced reference to Quality Assurance Manager with Quality Assurance Coordinator in Section 5.1 and Amended in Section 5.7
8.6	15-Dec-11	Changes to all sections after major upgrade to system processes
8.7	04-Jun-13	Changed References to WHS rather than OHS, defined 5.6 Risk Matrix and added 5.1.4 v) Queensland.
8.8	19-Aug-13	Added 5.1.1 and 5.8 re Corrective Action and Controls.
8.9	03-Jun-14	Amendments made to sections 2.0, 5.1 and 5.2. Amended definitions of some words. Implemented section of Hierarchy of controls.
8.10	02-Oct-15	Major amendments throughout procedure; amended date format in Section 8.