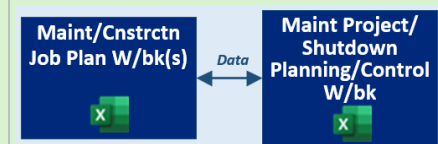


Maintenance & Construction Management / Project Toolkit (MS Excel & PowerPoint)

Workbooks in this maintenance and construction management / project toolkit utilise MS Excel's tabular spreadsheet functionality and maximise use of dropdown lists, cell formulae, row and column grouping, conditional formatting and cursor location highlighting. Comprehensive cell notes and embedded notes re workbook usage are provided. Power Point presentations are provided to support workbooks where practicable and to outline other maintenance, project and construction management concepts and methodology.

| MS Excel Workbooks | MS PowerPoint Slideshows / MP4 Videos |
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| Asset Maintenance Strategy Development Workbook comprises 6 worksheets to model maintenance strategy based on RCM, FMEA, FMECA (Qualitative) and RCA principles. Cell and embedded guidance notes based on principles presented in 'SAE JA1012 2002 - A Guide to the Reliability-Centred Maintenance (RCM) Standard' and 'RCM 3: Risk Based Reliability Centred Maintenance, Basson' are included. Columns are grouped for specific focus and to optimise worksheet use. <ul style="list-style-type: none"> • Worksheet #1 has a guidance flow chart re methodology and workbook use • Worksheet #2 has a functional failure mitigation logic chart • Worksheet #3 is used to model and optimise maintenance strategy • Worksheet #4 is automated and used to summarise failure mode causes and maintenance actions • Worksheet #5 has the risk assessment matrix used in worksheet #3 • Worksheet #6 has the dropdown lists used in other worksheets | Asset Maintenance Strategy Development Presentation comprises 10 slides including: <ul style="list-style-type: none"> • 4 slides with slide index, introduction, flow chart outlining asset maintenance strategy development process based on RCM, FMEA, FMECA (Qualitative) & RCA principles, flow chart outlining functional failure mitigation decision logic • 5 slides with worksheet images • 1 slide with an example of an embedded note. |
| Asset Maintenance Spares & Inventory Needs Analysis Workbook comprises 6 worksheets to model asset spares and inventory needs. <ul style="list-style-type: none"> • Worksheet #1 has an overview of spares-inventory analysis strategy • Worksheet #2 has a flow chart outlining asset spare parts and inventory needs analysis • Worksheet #3 is used to record parent asset data • Worksheet #4 is used to model and optimise spare parts and inventory needs analysis • Worksheet #5 has an RFI proforma for obtaining relevant OEM supply chain data • Worksheet #6 has the dropdown lists used in other worksheets | Asset Maintenance Spares & Inventory Needs Analysis Presentation comprises 10 slides including: <ul style="list-style-type: none"> • 3 slides with slide index, introduction and strategy for assessment of appropriate spare parts stockholding • 2 slides with a continuous, annotated flow chart outlining process for asset spare parts and inventory needs analysis • 6 slides with worksheet images. |
| Maintenance Management Review Workbook comprises the following 11 worksheets and is a comprehensive tool for reviewing, evaluating and reporting on organisational maintenance effectiveness and performance. Includes supporting info and flow charts for review facilitation. <ul style="list-style-type: none"> • Worksheet #1 is a review title page • Worksheet #2 has a flow chart outlining the review process • Worksheet #3 presents the generic MMAPS maintenance mission • Worksheet #4 presents the MMAPS maintenance service delivery model (simplified) • Worksheet #5 presents the MMAPS maintenance service delivery model (detailed) • Worksheet #6 has a flow chart outlining a typical maintenance work control process • Worksheet #7 is used to record observations, gaps perceived by users, comments and scores against review questionnaire items • Worksheet #8 is automated and used to record scores against review questionnaire items without observations / comments etc. • Worksheet #9 is an automated interface between worksheet #7 and worksheet #10 • Worksheet #10 presents automated review charts based on worksheet #8 and 9 • Worksheet #11 presents typical NZ Acts, Regulations and Codes of Practice related to industrial maintenance | Maintenance Management Review Presentation comprises 15 slides including: <ul style="list-style-type: none"> • 6 slides with slide index, review process overview, review process flow chart, MMAPS maintenance mission statement, MMAPS maintenance service delivery model (simplified), MMAPS maintenance service delivery model (detailed) • 3 slides showing review questionnaire • 2 slides with review form worksheet images • 3 slides showing review charts • 1 slide showing typical maintenance work control process. Review questions are based on MMAPS maintenance service delivery model. |
| Bow Tie Risk Analysis Workbook comprises 2 worksheets for Bow Tie analysis. <ul style="list-style-type: none"> • Worksheet #1 is a tabular, Bow Tie risk analysis template for detailing hazard / top event, threats / causes, threat / cause barriers / controls consequences and consequence barriers / controls • Worksheet #2 has the dropdown lists used in Worksheet #1 | Bow Tie Risk Analysis Presentation comprises 3 slides including: <ul style="list-style-type: none"> • 1 slide with slide index • 2 slides with worksheet images. |

| MS Excel Workbooks | MS PowerPoint Slideshows / MP4 Videos |
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| Root Cause Analysis (RCA) - Qualitative FTA & 5-Why Workbook comprises 3 worksheets for RCA. <ul style="list-style-type: none"> • Worksheet #1 has a tabular, qualitative FTA template with six levels of detail • Worksheet #2 is a tabular 5-Why template • Worksheet #3 has the dropdown lists used in other worksheets Worksheets #1 & #2 may be used as support for or alternatives to graphic cause and effect diagrams. | <i>Display of Worksheet #1 as image in PowerPoint slide isn't practical.</i> |
| Project Risk Register & Task Risk Reduction Estimator Workbook comprises 3 worksheets for modelling project risk. <ul style="list-style-type: none"> • Worksheet #1 is a project risk register used to list project risks and model risk contingencies • Worksheet #2 is used to model individual task durations / resource units based on perceived risks • Worksheet #3 has the dropdown lists used in other worksheets | Project Planning & Risk Management Presentation comprises 5 slides including: <ul style="list-style-type: none"> • 2 slides with slide index and flow chart outlining overall project planning process • 3 slides with worksheet images. |
| <i>No applicable worksheets, presentation exists to outline concepts and methodology.</i> | Outsourced Service Contracts Presentation comprises 6 slides including: <ul style="list-style-type: none"> • 2 slides with slide index and key hallmarks • 4 slides with a flow chart outlining process for developing and establishing outsourced, collaborative service contracts based on win / win |
| <i>No applicable worksheets, presentation exists to outline concepts and methodology.</i> | Construction Contract Quality Management in Process Plants Presentation comprises 18 slides including: <ul style="list-style-type: none"> • 2 slides with slide index and introduction • 4 slides with continuous, cross functional flow chart outlining construction contract quality management process • 8 slides with functional outlines re CQPs, ITPs, NCRs, completion inspection / punch listing, final inspection and QC documentation • 4 slides with ITP, Punch List and NCR forms |
| Maintenance / Construction Job Cost Estimator Workbook comprises 5 worksheets for maintenance and construction job costing. <ul style="list-style-type: none"> • Worksheet #1 is used for job details and has an overall, automated cost summary • Worksheet #2 is used to list job activities, allocate labour resources and analyse labour resource costs • Worksheet #3 is used to list job spares and materials and analyse their costs • Worksheet #4 is used to list job miscellaneous cost items and their suppliers and analyse their costs • Worksheet #5 has the dropdown lists used in other worksheets | Maintenance / Construction Job Cost Estimator Presentation comprises 6 slides including: <ul style="list-style-type: none"> • 1 slide with slide index • 5 slides with worksheet images. |
| Equipment Failure Modes-Possible Maintenance Actions Matrix Workbook comprises 1 worksheet with a wide range of industrial equipment types, equipment failure groups specific to equipment type, potential failure points / modes within each equipment failure group and ability to easily select possible maintenance actions for each potential failure point / mode. Filtering by equipment type and equipment failure group enables appropriate focus. <i>This workbook is being finalised and will be available soon</i> | Equipment Failure Modes-Possible Maintenance Actions Matrix Presentation comprises 2 slides including: <ul style="list-style-type: none"> • 1 slide - title • 1 slide showing worksheet excerpt with failure data for a single equipment type, in this case a screw compressor. |
| Forms / Registers Templates Workbook comprises 36 worksheets with an index worksheet and 32 construction / maintenance contract QHSE management form and register templates in individual worksheets. Forms can be extracted individually or in groups as required depending on their end use. Worksheets are individually numbered, the first worksheet being an index with links to respective individual worksheets within the workbook. Where appropriate, some worksheets include drop-down lists and / or formulae. | Forms / Registers Templates Presentation comprises 44 slides including: <ul style="list-style-type: none"> • 2 slides with workbook index • 42 slides showing specific maintenance / construction management QHSE / equipment form and register templates. |

| MS Excel Workbooks | MS PowerPoint Slideshows / MP4 Videos |
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| Maintenance / Construction Job Plan(s) Workbook comprises 16 integrated worksheets for maintenance / construction job planning, execution and reporting bringing all job planning, execution and reporting elements for a specific job together in one place. Data is entered once and data common to multiple worksheets is transferred automatically. These workbooks can be used in isolation or together with a Maintenance Project / Shutdown Planning / Control workbook for multiple jobs as a project. <ul style="list-style-type: none"> • Worksheet #1 is used to record job details and has links to other worksheets. Job details are linked to other worksheets and only need to be entered once. • Worksheet #2 is used to record all relevant asset details • Worksheet #3 is used to record details of relevant job-related documents and provide links to them • Worksheet #4 is used to list job activities, allocate labour resources, analyse labour resource costs and includes provision for updating progress • Worksheet #5 is used to record additional notes, tools and equipment for each job activity • Worksheet #6 is to identify and assess job activity risks / hazards and identify and assess risk / hazard controls • Worksheet #7 is an automated job time and cost summary • Worksheet #8 is used to list job spares and materials and analyse their costs • Worksheet #9 is used to list job miscellaneous cost items and their suppliers and to analyse their costs • Worksheet #10 is an Inspection and Test Plan (ITP) template. Multiple ITPs may be required. • Worksheet #11 is a Punch List template. Multiple Punch Lists may be required. • Worksheet #12 is used job work photos • Worksheet #13 is used for job work reporting, either fully or as links to embedded or separate documents • Worksheet #14 is used for job supplementary reports, either as scanned images or as links to embedded or separate documents e.g. NDT reports • Worksheet #15 has the risk-hazard matrix-criteria upon which worksheet #6 depends • Worksheet #16 has the dropdown lists used in other worksheets | Maintenance / Construction Job Plan(s) Presentation comprises 19 slides including: <ul style="list-style-type: none"> • 2 slides with slide index and introduction • 17 slides with worksheet images. |
| Maintenance Project / Shutdown Planning / Control This workbook comprises 10 integrated worksheets used to collate / manage multiple maintenance / construction job plans as a project and includes centralised timesheet functionality. <ul style="list-style-type: none"> • Worksheet #1 has a project / shutdown preparation flow chart • Worksheet #2 has a project / shutdown execution flow chart • Worksheet #3 has a project / shutdown planning and control system flow chart • Worksheet #4 is used as a project / shutdown overview and includes various asset and job data • Worksheet #5 is an automated project / shutdown cost summary • Worksheet #6 is an automated project / shutdown timesheet summary • Worksheet #7 is used for project / shutdown timesheet data entry • Worksheet #8 is an automated summary of project / shutdown resource hours • Worksheet #9 can be used to collate spares and materials from respective job plans into an overall project record • Worksheet #10 has the dropdown lists used in other worksheets | Maintenance Project / Shutdown Planning / Control Presentation comprises 12 slides <ul style="list-style-type: none"> • 5 slides with slide index, introduction, flow chart re project / shutdown preparation, flow chart re project / shutdown execution and management system diagram showing data flows • 7 slides with worksheet images. <p>Possible interaction between 'Maintenance / Construction Job Plan(s)' & 'Maintenance Project / Shutdown Planning / Control' workbooks. <i>(Refer to management system diagram in workbook for full detail.)</i></p>  |

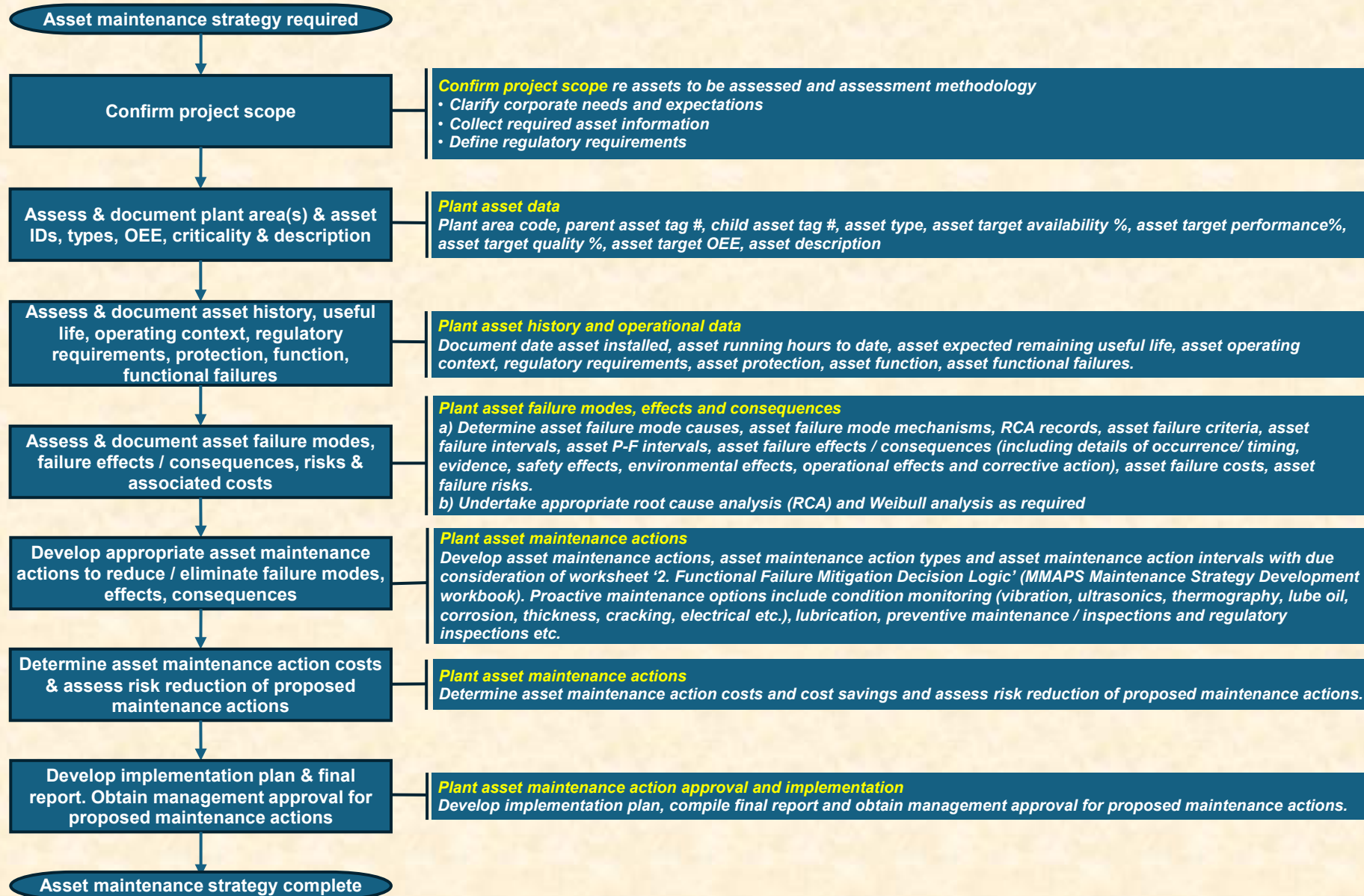
ASSET MAINTENANCE STRATEGY DEVELOPMENT

- Slide 2: Introduction**
- Slide 3: Flow chart outlining asset maintenance strategy development process**
- Slide 4: Flow chart outlining functional failure mitigation logic**
- Slide 5: Worksheet '3. Maintenance Strategy Development' - Outline Groups Closed (*images*)**
- Slides 6&7: Worksheet '3. Maintenance Strategy Development' - Outline Groups (*images, 2 slides*)**
- Slide 8: Worksheet '4. Recommended Maintenance Actions' (*image*)**
- Slide 9: Worksheet '6. Associated Dropdown Lists' (*image*)**
- Slide 10: Examples of Embedded Notes in Worksheet '3. Maintenance Strategy Development'**

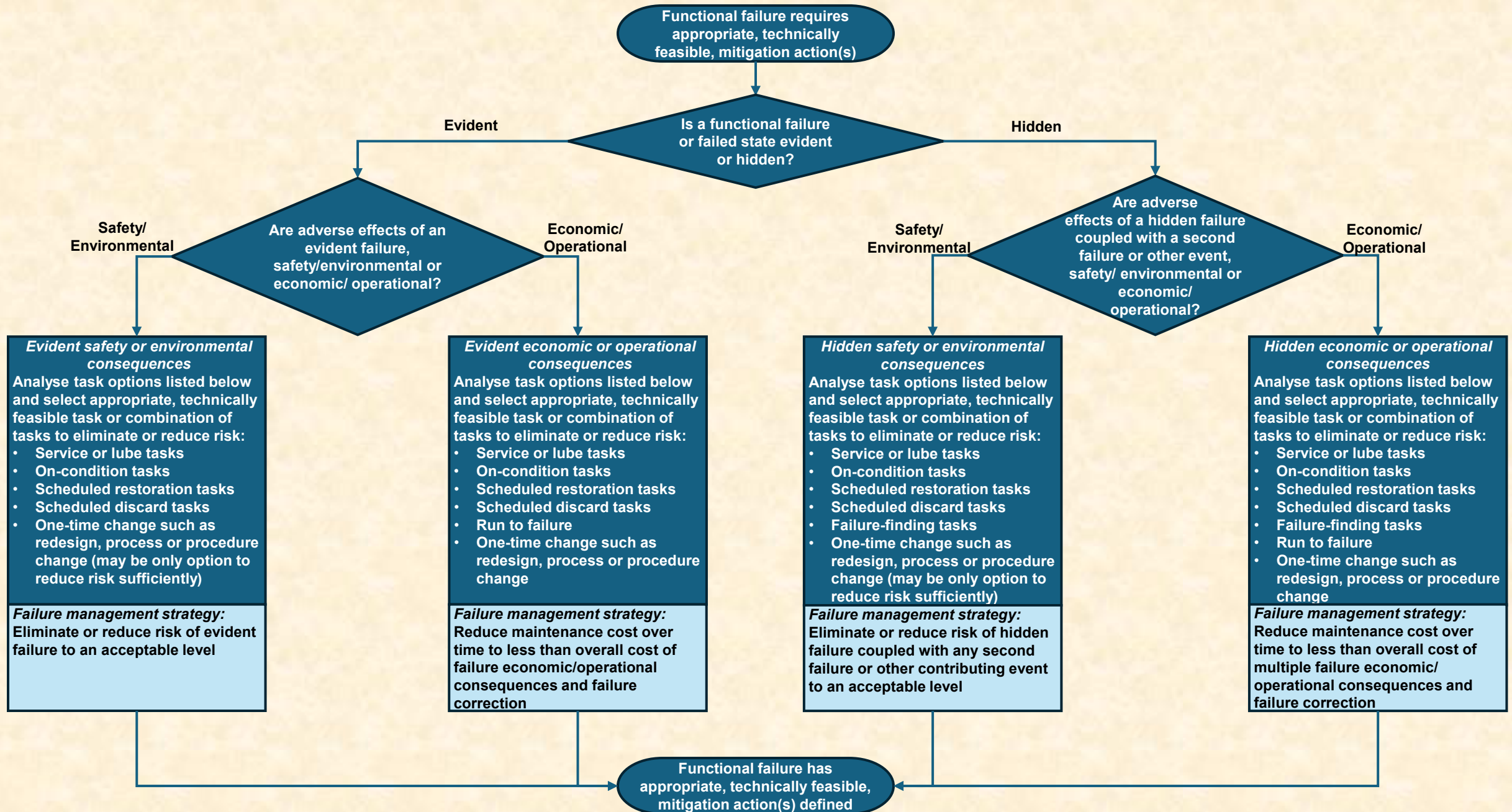
Introduction

- ☐ Presentation outlines asset maintenance strategy development using '**MMAPS Asset Maintenance Strategy**' workbook, '**3. Maint Strategy Development**' worksheet based on RCM, FMEA, FMECA(Qualitative) & RCA principles.
- ☐ Workbook comprises the following worksheets:
 - '**1. Review Process Flow Chart**'
 - '**2. Functional Failure Mitigation Logic**'
 - '**3. Maint Strategy Development**'.
 - '**4. Recommended Maint Actions**'
 - '**5. MMAPS Risk Hazard Matrix**'
 - '**6. Associated Dropdown Lists**'
- ☐ Analysis worksheet's features include;
 - Multiple embedded Word files and worksheet cell explanatory notes re RCM / FMEA theory and worksheet usage. Embedded files are opened by double clicking respective icons.
 - Automatic shading of active rows and columns on selection to reduce entry errors.
 - Outline grouping of worksheet columns with second tier data (on which top tier data columns depend) to keep worksheet size manageable in terms of data entry and report printing etc.
 - Frequent use of cell dropdown lists to reduce effort and improve effectiveness. Columns with dropdown lists are shaded light green.
 - Frequent use of cell formulae to reduce effort and improve effectiveness. Columns with dropdown lists are shaded light blue.
- ☐ Slide 3 is a flow chart outlining the principal steps involved in asset maintenance strategy development.
- ☐ Slide 4 is a flow chart outlining functional failure mitigation decision logic.
- ☐ Slide 5 is an image of '**3. Maint Strategy Development**' worksheet with all outline groups closed.
- ☐ Slides 6 & 7 show images of the various '**3. Maint Strategy Development**' worksheet outline groups expanded.
- ☐ Slide 8 is an image of '**4. Recommended Maintenance Actions**' worksheet.
- ☐ Slide 9 is an example of an embedded note in '**3. Maint Strategy Development**' worksheet.
- ☐ Slide 10 is an image of '**6. Associated Dropdown Lists**' worksheet.

Based on RCM, FMEA, FMECA(Qualitative) & RCA Principles using 'MMAPS Asset Maintenance Strategy Workbook' (MS Excel)



FUNCTIONAL FAILURE MITIGATION DECISION LOGIC



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MAINTENANCE ACTIONS

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| Principal Risk | Maint Action ID | Maintenance Action Description | Action Type RCM Context | Action Type Maint Management Context | Implement (Y/N) | Maintenance Action Interval (Hrs) | Action Annual Cost (\$) | Action Overall Cost (\$) | Action Annual Saving (\$) | Action Duration (Hrs) | Outage Req'd? (Y/N) | RPN | Detectability | Highest Risk Score | Principal Risk |
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Worksheet 3. Maint Strategy Development

- All outline groups closed
- Image overlap marked with red arrows

[illegible]

| Col AR-AS-AT-AU-AV-AW-AX Group | | | | | | | | | | | | Col BA-BB-BC-BD-BE-BF-BG-BH-BI-BJ-BK Group | | | | | | | | | | | | |
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| FAILURE EFFECTS / CONSEQUENCES | | | | | | | FAILURE EFFECTS / CONSEQUENCES COST ANALYSIS | | | | | | | | | | |
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| Failure Occurrence / Timing / Frequency | Failure Evidence | Failure Effects on Safety | Failure Effects on Environment | Failure Effects on Operations & / or Production | Failure Damage & Consequential Damage | Failure Corrective Action | Annual Operating Time (Hrs) | Approximate Interval Between Failures (Hrs) | Outage? (Y/N) | Outage Duration (Hrs) | Outage Cost Rate (\$/Hr) | Outage Cost (\$) | Failure Labour (ManHrs) | Failure Labour Rate (\$/Hr) | Failure Labour Cost (\$) | Failure Materials Cost (\$) | Failure Misc Costs (\$) |
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MAINTENANCE ACTIONS COST ANALYSIS

| Outage Cost Hourly Rate (\$/Hr) | Outage Cost (\$) | Action Labour (ManHrs) | Labour Rate (\$/Hr) | Action Labour Cost (\$) | Action Materials Cost (\$) | Action Misc Other Costs (\$) |
|--|------------------------|------------------------|---------------------------|----------------------------------|-------------------------------------|--|
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| RISK | |
|-------------------------------|---|
| People Risk - Severity | ✓ |
| People Risk - Likelihood | ✓ |
| Environment Risk - Severity | ✓ |
| Environment Risk - Likelihood | ✓ |
| Equipment Risk - Severity | ✓ |
| Equipment Risk - Likelihood | ✓ |
| Production Risk - Severity | ✓ |
| Production Risk - Likelihood | ✓ |
| Quality Risk - Severity | ✓ |
| Quality Risk - Likelihood | ✓ |
| Reputation Risk - Severity | ✓ |
| Reputation Risk - Likelihood | ✓ |

1

2

A

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Column H OVERALL
FAILURE COST

Column N Overall
Action Cost

RECOMMENDED MAINTENANCE ACTIONS

Based on RCM, FMEA, FMECA(Qualitative) and RCA Principles

Client:

Date: 30/10/2024

| Plant Area Code | Parent Asset Tag # | Child Asset Tag # | Asset Description | Target OEE | Failure Mode Cause Description | Annual Failure Cost (\$) | Overall Failure Cost (\$) | RPN | Principal Risk | Maintenance Action Description | Action Annual Cost (\$) | Action Annual Saving (\$) | Action Overall Cost (\$) | RPN | Principal Risk |
|-----------------|--------------------|-------------------|-------------------|------------|--------------------------------|--------------------------|---------------------------|-----|----------------|--------------------------------|-------------------------|---------------------------|--------------------------|-----|----------------|
| | | | | | | | | | | | | | | | |
| | | | | 0% | | \$ - | \$ - | 0 | | | \$ - | \$ - | \$ - | 0 | |
| | | | | 0% | | \$ - | \$ - | 0 | | | \$ - | \$ - | \$ - | 0 | |

WORKSHEET '6. ASSOCIATED DROPDOWN LISTS'

MMAPS

MAINTENANCE STRATEGY
DROP DOWN LISTS

| LabourRate (Client Specific) | |
|---------------------------------|--|
| | |

| Yes or No |
|-----------|
| Y |
| N |

| Interval | |
|----------|------------------------|
| 40 | 40 Hr/Week |
| 80 | 40 Hr/W Fortnight |
| 160 | 40 Hr/W Month |
| 320 | 40 Hr/W 2-Month |
| 480 | 40 Hr/W 3-Month |
| 640 | 40 Hr/W 4-Month |
| 960 | 40 Hr/W 6-Month |
| 2080 | 40 Hr/W Year |
| 3120 | 40 Hr/W 18-Month |
| 4160 | 40 Hr/W 2-Year |
| 6240 | 40 Hr/W 3-Year |
| 8320 | 40 Hr/W 4-Year |
| 10400 | 40 Hr/W 5-Year |
| 20800 | 40 Hr/W 10-Year |
| 168 | 24 Hr/D Week |
| 336 | 24 Hr/D Fortnight |
| 720 | 24 Hr/D Month (30D) |
| 1440 | 24 Hr/D 2-Month (30D) |
| 2160 | 24 Hr/D 3-Month (30D) |
| 2880 | 24 Hr/D 4-month (30D) |
| 4320 | 24 Hr/D 6-Month (30D) |
| 8760 | 24 Hr/D Year (365D) |
| 13080 | 24 Hr/D 18-Month |
| 17520 | 24 Hr/D 2-Year (365D) |
| 26280 | 24 Hr/D 3-Year (365D) |
| 35040 | 24 Hr/D 4-Year (365D) |
| 43800 | 24 Hr/D 5-Year (365D) |
| 87600 | 24 Hr/D 10-Year (365D) |

| AssetCriticality (Client Specific) | |
|---|---|
| unacceptable | 1 |
| Production or service lost completely for <1day or safety or environmental impact tolerable | 2 |
| Production or service reduced by >50% for >1day or safety or environmental risk high | 3 |
| Production or service reduced by >50% for <1day or safety or environmental risk medium | 4 |
| Production or service reduced by <50% for >1day or safety or environmental risk low | 5 |
| Production or service reduced by <50% for <1day or safety or environmental risk very low | 6 |
| low | 7 |

| Plant Area (Client Specific - customise for each Client) | |
|--|--|
| | |

| Asset Type (Client Specific - customise for each Client) | |
|--|--|
| | |

| Severity / Consequences | |
|-------------------------|---|
| Insignificant | 1 |
| Mild | 2 |
| Moderate | 3 |
| Significant | 4 |
| Catastrophic | 5 |

| Detectability | |
|---------------------|---|
| Detectable | 1 |
| Probably detectable | 2 |
| Possibly detectable | 3 |
| Undetectable | 4 |

| Likelihood / | |
|--------------|---|
| Low | 1 |
| Low-Medium | 2 |
| Medium | 3 |
| Medium-High | 4 |
| High | 5 |

| Maintenance Type (RCM) | |
|-------------------------|-----|
| Service or lube tasks | SLT |
| On-condition tasks | OCT |
| Sched restoration tasks | SRT |
| Sched discard tasks | SDT |
| Run-to-failure | RTF |
| Failure-finding tasks | FFT |
| One-time change | OTC |

| Function Type | |
|---------------|---|
| Primary | P |
| Secondary | S |

| Maintenance Type | |
|----------------------|------|
| Service or lube | SL |
| Preventive | PM |
| Inspection | INSP |
| Predictive | PdM |
| Condition Monitoring | CbM |
| Corrective | CM |
| Fix on Fail | FOF |
| Modification | MOD |
| Redesign | RED |

| Principal Risk Effect | |
|-----------------------|----|
| Safety | S |
| Environmental | E |
| Economic/Operational | EO |

| Installed Condition | |
|---------------------|----|
| New | N |
| Used | U |
| Refurbished Fully | RF |
| Refurbished Partly | RP |

MMAPS

Maintenance Strategy Workbook Maintenance Strategy Worksheet

RCM, FMEA, FMECA(Qualitative) and RCA Principles Section Notes

Based on principles presented in 'SAE JA1012 2002 – A Guide to the Reliability-Centred Maintenance (RCM) Standard' and 'RCM3: Risk Based Reliability Centred Maintenance - Basson'

RCM, FMEA, FMECA(Qualitative) and RCA Principles

This maintenance strategy worksheet is based on RCM, FMEA, FMECA(Qualitative) and RCA principles.

RCM (Reliability Centred Maintenance) is a process used to determine minimum, safe levels of maintenance, engineering and other related risk management strategies required to optimise an asset's safety and environmental integrity and cost-effective operational capability in its operating context over its life cycle, in accordance with the asset operator's functional and operational expectations.

RCM requires the consideration of eight questions regarding each asset or system under review:

1. What is the operating context of the asset or system (i.e. operating conditions and how used)?
2. What are the functions and associated performance standards of the asset or system in its present operating context?
3. What are the ways in which the asset or system may fail to fulfil its functions (i.e. functional failures or failed states)?
4. What are the causes of each functional failure or failed state (i.e. failure modes)?
5. What are the effects and consequences of each functional failure when it occurs?
6. What are the risks and risk levels associated with each functional failure?
7. What can be done proactively to reduce intolerable risks to tolerable levels?
8. What can be done to reduce or manage risks in a cost-effective manner?

FMEA (Failure Modes and Effects Analysis) is a process used to:

1. Identify and fully understand potential failure modes, failure causes and failure effects for assets, processes, and systems.
2. Assess risks associated with identified failure modes, failure causes and failure effects and prioritise issues for mitigative or corrective action.
3. Identify, define, and implement mitigative or corrective actions and thereby reduce asset, process and system risks to tolerable levels.

FMECA Failure Modes, Effects and Criticality Analysis) is an extension of FMEA by including criticality analysis whereby failure mode probability/ likelihood and severity are assessed enabling failure modes to be ranked according to their respective criticality.

RCA (Root Cause Analysis) is a process used to identify fundamental or root causes of problems or failures in order to identify appropriate solutions. This involves defining the problem, understanding the process, identifying possible causes, collecting data (evidence), analysing data (evidence), identifying possible solutions, selecting solutions, implementing solutions, evaluating effects, and institutionalising change.

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Maintenance Strategy Workbook Maintenance Strategy Worksheet

Target OEE Column Notes

OEE or 'overall equipment effectiveness' is a single measure of an asset's **availability** to produce, **performance** re output or production rate and **quality** of output or production.

Availability is the ratio of Actual Production Time to Potential Production Time.

I.e., **Availability** = Actual Production Time / Potential or Possible Production Time

Performance is the ratio of Actual Output to Theoretical Output.

I.e., **Performance** = Actual Output / Theoretical Output

Quality is the ratio of good or compliant output or production to total good or compliant output or production.

I.e., **Quality** = Good (Compliant) Output / Total Output

OEE = Availability ratio x Performance ratio x Quality ratio

100% OEE means only good (compliant) product is manufactured, as fast as possible, with no stop or down time

85% OEE is considered world class

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Maintenance Strategy Workbook Maintenance Strategy Worksheet

Functional Failure Column Notes

Functional Failure (or Failed State)

(based on 'SAE JA1012 2002 – A Guide to the Reliability-Centred Maintenance (RCM) Standard')

A functional failure is a state in which a physical asset or system is unable to perform a specific function to a desired level of performance. All failed states associated with each function should be identified.

Every asset has more than one function, each of which could fail in isolation so any asset can suffer from a variety of failed states. For this reason, it is more accurate to define failure in terms of the loss of specific functions, rather than failure of a complete asset.

Functional failures may be **total** or **partial**. A function performing at less than the desired minimum performance standard is a partial failure. E.g., a pump may pump nothing at all which is a total failure or at less than the desired rate which is a partial failure.

Performance standards associated with some functions incorporate **upper and lower limits** and an asset has failed if it performs above the upper limit or below the lower limit. In these cases, the breach of the upper limit needs to be documented separately to breach of the lower limit because failure modes and / or consequences associated with exceeding the upper limit are usually different from those associated with a breach below the lower limit. E.g., machining tolerances.]

ASSET MAINTENANCE - SPARE PARTS & INVENTORY NEEDS ANALYSIS

Slide 2: Introduction

Slide 3: Strategy for assessment of appropriate spare parts stockholding

Slides 4&5: Continuous flow chart outlining asset spare parts and inventory needs analysis process

Slide 6: Worksheet '3. Parent Asset Data' (*images*)

Slides 7&8: Worksheet '4. Spares-Inventory Analysis' (*images*)

Slide 9: Worksheet '5. Proprietary Spares – RFI Pro Forma re OEM Supply Chain (*image*)

Slide 10: Worksheet '6. Associated Dropdown Lists (*image*)

Introduction

- ❑ Presentation outlines asset maintenance spare parts and inventory needs analysis using '**MMAPS Asset Maintenance Spare Parts & Inventory Needs Analysis**' workbook.
- ❑ Workbook comprises the following worksheets:
 - '**1. Spares-Inventory Strategy**' (flow chart)
 - '**2. Asset Spares Review Process**' contains a flowchart laying out spares / inventory analysis steps.
 - '**3. Parent Asset Data**' is used to collate the asset criticality, asset maintenance history, future maintenance requirements and OEM data required to support spares and inventory stockholding analysis in worksheet #4.
 - '**4. Spares-Inventory Analysis**' is used to analyse spares and inventory stockholding.
 - '**5. RFI Proforma-OEM Supply Chain**' is a proforma used for requests for supply chain information from OEMs and suppliers such as lead times and unit costs etc.
 - '**6. Associated Dropdown Lists**'
- ❑ Analysis worksheets' features include;
 - Multiple worksheet cell explanatory notes re spare parts analysis and worksheet usage.
 - Automatic shading of active rows and columns on selection to reduce entry errors.
 - Outline grouping of worksheet columns with second tier data (on which top tier data columns depend) to keep worksheet size manageable in terms of data entry and report printing etc.
 - Frequent use of cell dropdown lists to reduce effort and improve effectiveness. Columns with cell dropdown lists are shaded light green.
 - Frequent use of cell formulae to reduce effort and improve effectiveness. Columns with cell formulae are shaded light blue.
- ❑ Slide 3 outlines basic strategy for assessment of appropriate spares stockholding.
- ❑ Slides 4 & 5 form a continuous, animated flow chart outlining the process of spare parts and inventory needs analysis.
- ❑ Slides 6, 7 & 8 show images of worksheets '**3. Parent Asset Data**' and '**4. Spares-Inventory Analysis**' i.e., basic worksheets with outline groups closed and separate images of expanded outline groups
- ❑ Slide 9 shows image of worksheet '**5. RFI Pro Forma-OEM Supply Chain**'
- ❑ Slide 10 shows image of worksheet '**6. Associated Drop Down Lists**'

Strategy for assessment of appropriate spare parts stockholding:

Assessment of maintenance spares stockholding is based on reasonable, realistic assessment of:

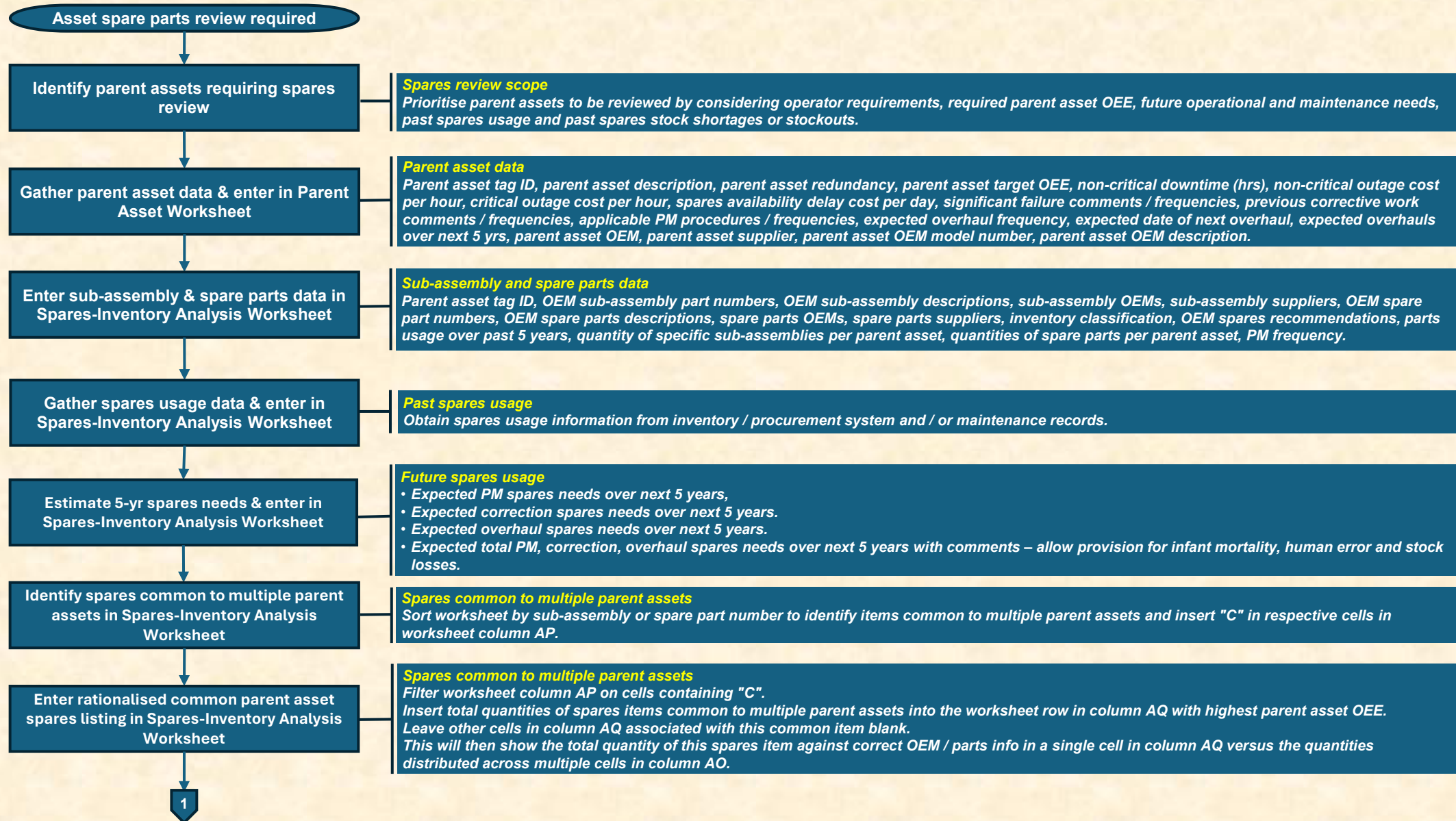
- parent asset criticality according to required OEE.
- spares usage over past 5 years of operation.
- spares likely to be required for on-condition maintenance, preventive maintenance, corrective maintenance, and overhauls of assets over next 5 to 7 years of operation.
- supply chain effectiveness including spares availability, spares delivery lead times and EOQs.

The aim of this approach is to optimise spares availability for maintenance and to minimise inventory levels and effects of any unforeseen operational events in line with assessed demand by ensuring:

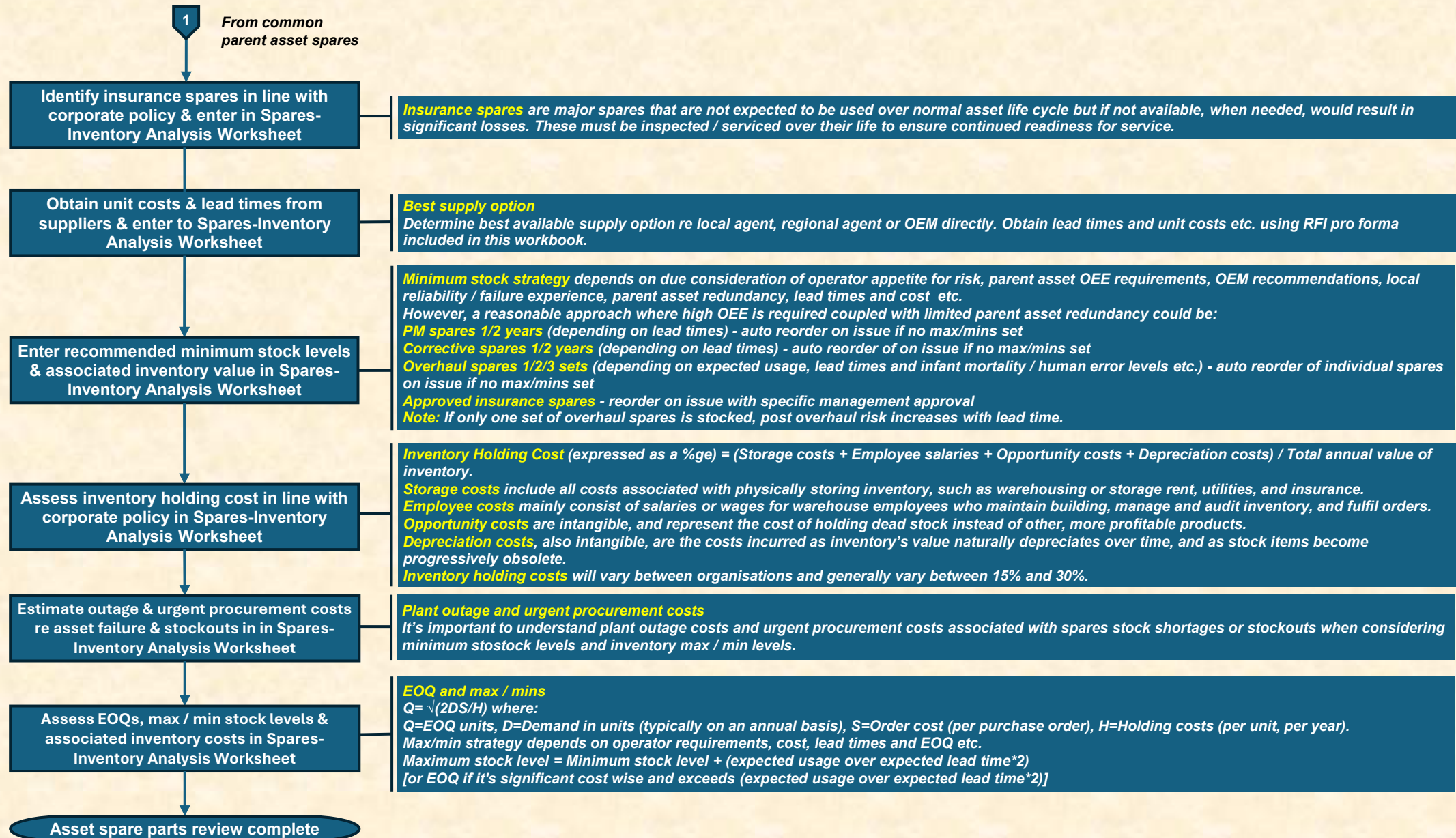
- parent assets are identified and correctly documented.
- appropriate specifications and supply details of spares likely to be needed are identified and documented.
- anticipated spares usage is assessed and documented.
- appropriate inventory maximum and minimum stock levels are identified and documented.

Basing inventory stock holding on historical spares usage, anticipated future corrective / preventive spares usage and minimum future overhaul spares usage minimises risk of stock shortfalls. Stock levels so derived, require regular review and adjustment over time as circumstances and demand change.

FLOW CHART - SPARE PARTS & INVENTORY NEEDS ANALYSIS' - SLIDE 1/2



FLOW CHART - SPARE PARTS & INVENTORY NEEDS ANALYSIS - SLIDE 2/2



WORKSHEET '3. PARENT ASSET DATA'

| | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|--|-------------|--------------|---------------------------------|-------------------------------|--|------------------------------------|-----------------------------------|---|--------------------------------------|---|--------------------------|---------------------|------------------------------------|--------------------------------|--------------------------------------|-----|---|--------------|-----------------|--|--|--|--|--|--|
| 1 | Basic worksheet with one outline group open and one closed | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | A | B | C | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | | | | | | |
| 4 | MMAPS | | | Columns D:F TARGET OEE CRITERIA | | | | | | | | | | | | | | Columns K:S PARENT ASSET MAINTENANCE OVERVIEW | | | | | | | | |
| 5 | PROPRIETARY SPARE PARTS & INVENTORY NEEDS ANALYSIS - PARENT ASSET DATA | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | Print A3, column DEF group closed | | | | | | | | | | | | | | | | | Formula | | Drop down list | | | | | | |
| 7 | Parent Asset Operational Data | | | | | | | Parent Asset Maintenance Overview | | | | | | | | | | Parent Asset OEM Data | | | | | | | | |
| 8 | Tag ID | Description | Redundancy % | Target OEE (%) | Non-critical Downtime (Hours) | Non-critical Outage Cost per Hour (\$) | Critical Outage Cost per Hour (\$) | Previous Significant Failures | Previous Significant Failure Interval (Hours) | Previous Corrective Work Description | Previous Corrective Work Interval (Hours) | Applicable PM Procedures | PM Interval (Hours) | Expected Overhaul Interval (Hours) | Expected Date of Next Overhaul | Expected Overhauls Over Next 5 Years | OEM | Supplier | OEM Model No | OEM Description | | | | | | |
| 9 | | | | 0% | | | | | | | | | | | | | | | | | | | | | | |
| 10 | | | | 0% | | | | | | | | | | | | | | | | | | | | | | |

| | | |
|-----------------------------|----------------------------|------------------------|
| | | |
| D | E | F |
| Inventory Needs Analysis | | |
| Operational Data | | |
| Target OEE Availability (%) | Target OEE Performance (%) | Target OEE Quality (%) |
| | | |
| | | |

3. Parent Asset Data Worksheet
Columns D/E/F outline group

| | |
|---|---|
| | |
| BS | |
| | |
| | |
| Estimated Inventory Holding Cost for Proposed Maximum Stock Levels \$ | |
| | |
| \$ | - |
| \$ | - |

4. Spares-Inventory Analysis Worksheet
Column BS outline group

WORKSHEET '4. SPARES-INVENTORY ANALYSIS' - SLIDE 1/2

Basic worksheet with all outline groups closed

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 | 131 | 132 | 133 | 134 | 135 | 136 | 137 | 138 | 139 | 140 | 141 | 142 | 143 | 144 | 145 | 146 | 147 | 148 | 149 | 150 | 151 | 152 | 153 | 154 | 155 | 156 | 157 | 158 | 159 | 160 | 161 | 162 | 163 | 164 | 165 | 166 | 167 | 168 | 169 | 170 | 171 | 172 | 173 | 174 | 175 | 176 | 177 | 178 | 179 | 180 | 181 | 182 | 183 | 184 | 185 | 186 | 187 | 188 | 189 | 190 | 191 | 192 | 193 | 194 | 195 | 196 | 197 | 198 | 199 | 200 | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | 229 | 230 | 231 | 232 | 233 | 234 | 235 | 236 | 237 | 238 | 239 | 240 | 241 | 242 | 243 | 244 | 245 | 246 | 247 | 248 | 249 | 250 | 251 | 252 | 253 | 254 | 255 | 256 | 257 | 258 | 259 | 260 | 261 | 262 | 263 | 264 | 265 | 266 | 267 | 268 | 269 | 270 | 271 | 272 | 273 | 274 | 275 | 276 | 277 | 278 | 279 | 280 | 281 | 282 | 283 | 284 | 285 | 286 | 287 | 288 | 289 | 290 | 291 | 292 | 293 | 294 | 295 | 296 | 297 | 298 | 299 | 300 | 301 | 302 | 303 | 304 | 305 | 306 | 307 | 308 | 309 | 310 | 311 | 312 | 313 | 314 | 315 | 316 | 317 | 318 | 319 | 320 | 321 | 322 | 323 | 324 | 325 | 326 | 327 | 328 | 329 | 330 | 331 | 332 | 333 | 334 | 335 | 336 | 337 | 338 | 339 | 340 | 341 | 342 | 343 | 344 | 345 | 346 | 347 | 348 | 349 | 350 | 351 | 352 | 353 | 354 | 355 | 356 | 357 | 358 | 359 | 360 | 361 | 362 | 363 | 364 | 365 | 366 | 367 | 368 | 369 | 370 | 371 | 372 | 373 | 374 | 375 | 376 | 377 | 378 | 379 | 380 | 381 | 382 | 383 | 384 | 385 | 386 | 387 | 388 | 389 | 390 | 391 | 392 | 393 | 394 | 395 | 396 | 397 | 398 | 399 | 400 | 401 | 402 | 403 | 404 | 405 | 406 | 407 | 408 | 409 | 410 | 411 | 412 | 413 | 414 | 415 | 416 | 417 | 418 | 419 | 420 | 421 | 422 | 423 | 424 | 425 | 426 | 427 | 428 | 429 | 430 | 431 | 432 | 433 | 434 | 435 | 436 | 437 | 438 | 439 | 440 | 441 | 442 | 443 | 444 | 445 | 446 | 447 | 448 | 449 | 450 | 451 | 452 | 453 | 454 | 455 | 456 | 457 | 458 | 459 | 460 | 461 | 462 | 463 | 464 | 465 | 466 | 467 | 468 | 469 | 470 | 471 | 472 | 473 | 474 | 475 | 476 | 477 | 478 | 479 | 480 | 481 | 482 | 483 | 484 | 485 | 486 | 487 | 488 | 489 | 490 | 491 | 492 | 493 | 494 | 495 | 496 | 497 | 498 | 499 | 500 | 501 | 502 | 503 | 504 | 505 | 506 | 507 | 508 | 509 | 510 | 511 | 512 | 513 | 514 | 515 | 516 | 517 | 518 | 519 | 520 | 521 | 522 | 523 | 524 | 525 | 526 | 527 | 528 | 529 | 530 | 531 | 532 | 533 | 534 | 535 | 536 | 537 | 538 | 539 | 540 | 541 | 542 | 543 | 544 | 545 | 546 | 547 | 548 | 549 | 550 | 551 | 552 | 553 | 554 | 555 | 556 | 557 | 558 | 559 | 560 | 561 | 562 | 563 | 564 | 565 | 566 | 567 | 568 | 569 | 570 | 571 | 572 | 573 | 574 | 575 | 576 | 577 | 578 | 579 | 580 | 581 | 582 | 583 | 584 | 585 | 586 | 587 | 588 | 589 | 590 | 591 | 592 | 593 | 594 | 595 | 596 | 597 | 598 | 599 | 600 | 601 | 602 | 603 | 604 | 605 | 606 | 607 | 608 | 609 | 610 | 611 | 612 | 613 | 614 | 615 | 616 | 617 | 618 | 619 | 620 | 621 | 622 | 623 | 624 | 625 | 626 | 627 | 628 | 629 | 630 | 631 | 632 | 633 | 634 | 635 | 636 | 637 | 638 | 639 | 640 | 641 | 642 | 643 | 644 | 645 | 646 | 647 | 648 | 649 | 650 | 651 | 652 | 653 | 654 | 655 | 656 | 657 | 658 | 659 | 660 | 661 | 662 | 663 | 664 | 665 | 666 | 667 | 668 | 669 | 670 | 671 | 672 | 673 | 674 | 675 | 676 | 677 | 678 | 679 | 680 | 681 | 682 | 683 | 684 | 685 | 686 | 687 | 688 | 689 | 690 | 691 | 692 | 693 | 694 | 695 | 696 | 697 | 698 | 699 | 700 | 701 | 702 | 703 | 704 | 705 | 706 | 707 | 708 | 709 | 710 | 711 | 712 | 713 | 714 | 715 | 716 | 717 | 718 | 719 | 720 | 721 | 722 | 723 | 724 | 725 | 726 | 727 | 728 | 729 | 730 | 731 | 732 | 733 | 734 | 735 | 736 | 737 | 738 | 739 | 740 | 741 | 742 | 743 | 744 | 745 | 746 | 747 | 748 | 749 | 750 | 751 | 752 | 753 | 754 | 755 | 756 | 757 | 758 | 759 | 760 | 761 | 762 | 763 | 764 | 765 | 766 | 767 | 768 | 769 | 770 | 771 | 772 | 773 | 774 | 775 | 776 | 777 | 778 | 779 | 780 | 781 | 782 | 783 | 784 | 785 | 786 | 787 | 788 | 789 | 790 | 791 | 792 | 793 | 794 | 795 | 796 | 797 | 798 | 799 | 800 | 801 | 802 | 803 | 804 | 805 | 806 | 807 | 808 | 809 | 810 | 811 | 812 | 813 | 814 | 815 | 816 | 817 | 818 | 819 | 820 | 821 | 822 | 823 | 824 | 825 | 826 | 827 | 828 | 829 | 830 | 831 | 832 | 833 | 834 | 835 | 836 | 837 | 838 | 839 | 840 | 841 | 842 | 843 | 844 | 845 | 846 | 847 | 848 | 849 | 850 | 851 | 852 | 853 | 854 | 855 | 856 | 857 | 858 | 859 | 860 | 861 | 862 | 863 | 864 | 865 | 866 | 867 | 868 | 869 | 870 | 871 | 872 | 873 | 874 | 875 | 876 | 877 | 878 | 879 | 880 | 881 | 882 | 883 | 884 | 885 | 886 | 887 | 888 | 889 | 890 | 891 | 892 | 893 | 894 | 895 | 896 | 897 | 898 | 899 | 900 | 901 | 902 | 903 | 904 | 905 | 906 | 907 | 908 | 909 | 910 | 911 | 912 | 913 | 914 | 915 | 916 | 917 | 918 | 919 | 920 | 921 | 922 | 923 | 924 | 925 | 926 | 927 | 928 | 929 | 930 | 931 | 932 | 933 | 934 | 935 | 936 | 937 | 938 | 939 | 940 | 941 | 942 | 943 | 944 | 945 | 946 | 947 | 948 | 949 | 950 | 951 | 952 | 953 | 954 | 955 | 956 | 957 | 958 | 959 | 960 | 961 | 962 | 963 | 964 | 965 | 966 | 967 | 968 | 969 | 970 | 971 | 972 | 973 | 974 | 975 | 976 | 977 | 978 | 979 | 980 | 981 | 982 | 983 | 984 | 985 | 986 | 987 | 988 | 989 | 990 | 991 | 992 | 993 | 994 | 995 | 996 | 997 | 998 | 999 | 1000 | 1001 | 1002 | 1003 | 1004 | 1005 | 1006 | 1007 | 1008 | 1009 | 1010 | 1011 | 1012 | 1013 | 1014 | 1015 | 1016 | 1017 | 1018 | 1019 | 1020 | 1021 | 1022 | 1023 | 1024 | 1025 | 1026 | 1027 | 1028 | 1029 | 1030 | 1031 | 1032 | 1033 | 1034 | 1035 | 1036 | 1037 | 1038 | 1039 | 1040 | 1041 | 1042 | 1043 | 1044 | 1045 | 1046 | 1047 | 1048 | 1049 | 1050 | 1051 | 1052 | 1053 | 1054 | 1055 | 1056 | 1057 | 1058 | 1059 | 1060 | 1061 | 1062 | 1063 | 1064 | 1065 | 1066 | 1067 | 1068 | 1069 | 1070 | 1071 | 1072 | 1073 | 1074 | 1075 | 1076 | 1077 | 1078 | 1079 | 1080 | 1081 | 1082 | 1083 | 1084 | 1085 | 1086 | 1087 | 1088 | 1089 | 1090 | 1091 | 1092 | 1093 | 1094 | 1095 | 1096 | 1097 | 1098 | 1099 | 1100 | 1101 | 1102 | 1103 | 1104 | 1105 | 1106 | 1107 | 1108 | 1109 | 1110 | 1111 | 1112 | 1113 | 1114 | 1115 | 1116 | 1117 | 1118 | 1119 | 1120 | 1121 | 1122 | 1123 | 1124 | 1125 | 1126 | 1127 | 1128 | 1129 | 1130 | 1131 | 1132 | 1133 | 1134 | 1135 | 1136 | 1137 | 1138 | 1139 | 1140 | 1141 | 1142 | 1143 | 1144 | 1145 | 1146 | 1147 | 1148 | 1149 | 1150 | 1151 | 1152 | 1153 | 1154 | 1155 | 1156 | 1157 | 1158 | 1159 | 1160 | 1161 | 1162 | 1163 | 1164 | 1165 | 1166 | 1167 | 1168 | 1169 | 1170 | 1171 | 1172 | 1173 | 1174 | 1175 | 1176 | 1177 | 1178 | 1179 | 1180 | 1181 | 1182 | 1183 | 1184 | 1185 | 1186 | 1187 | 1188 | 1189 | 1190 | 1191 | 1192 | 1193 | 1194 | 1195 | 1196 | 1197 | 1198 | 1199 | 1200 | 1201 | 1202 | 1203 | 1204 | 1205 | 1206 | 1207 | 1208 | 1209 | 1210 | 1211 | 1212 | 1213 | 1214 | 1215 | 1216 | 1217 | 1218 | 1219 | 1220 | 1221 | 1222 | 1223 | 1224 | 1225 | 1226 | 1227 | 1228 | 1229 | 1230 | 1231 | 1232 | 1233 | 1234 | 1235 | 1236 | 1237 | 1238 | 1239 | 1240 | 1241 | 1242 | 1243 | 1244 | 1245 | 1246 | 1247 | 1248 | 1249 | 1250 | 1251 | 1252 | 1253 | 1254 | 1255 | 1256 | 1257 | 1258 | 1259 | 1260 | 1261 | 1262 | 1263 | 1264 | 1265 | 1266 | 1267 | 1268 | 1269 | 1270 | 1271 | 1272 | 1273 | 1274 | 1275 | 1276 | 1277 | 1278 | 1279 | 1280 | 1281 | 1282 | 1283 | 1284 | 1285 | 1286 | 1287 | 1288 | 1289 | 1290 | 1291 | 1292 | 1293 | 1294 | 1295 | 1296 | 1297 | 1298 | 1299 | 1300 | 1301 | 1302 | 1303 | 1304 | 1305 | 1306 | 1307 | 1308 | 1309 | 1310 | 1311 | 1312 | 1313 | 1314 | 1315 | 1316 | 1317 | 1318 | 1319 | 1320 | 1321 | 1322 | 1323 | 1324 | 1325 | 1326 | 1327 | 1328 | 1329 | 1330 | 1331 | 1332 | 1333 | 1334 | 1335 | 1336 | 1337 | 1338 | 1339 | 1340 | 1341 | 1342 | 1343 | 1344 | 1345 | 1346 | 1347 | 1348 | 1349 | 1350 | 1351 | 1352 | 1353 | 1354 | 1355 | 1356 | 1357 | 1358 | 1359 | 1360 | 1361 | 1362 | 1363 | 1364 | 1365 | 1366 | 1367 | 1368 | 1369 | 1370 | 1371 | 1372 | 1373 | 1374 | 1375 | 1376 | 1377 | 1378 | 1379 | 1380 | 1381 | 1382 | 1383 | 1384 | 1385 | 1386 | 1387 | 1388 | 1389 | 1390 | 1391 | 1392 | 1393 | 1394 | 1395 | 1396 | 1397 | 1398 | 1399 | 1400 | 1401 | 1402 | 1403 | 1404 | 1405 | 1406 | 1407 | 1408 | 1409 | 1410 | 1411 | 1412 | 1413 | 1414 | 1415 | 1416 | 1417 | 1418 | 1419 | 1420 | 1421 | 1422 | 1423 | 1424 | 1425 | 1426 | 1427 | 1428 | 1429 | 1430 | 1431 | 1432 | 1433 | 1434 | 1435 | 1436 | 1437 | 1438 | 1439 | 1440 | 1441 | 1442 | 1443 | 1444 | 1445 | 1446 | 1447 | 1448 | 1449 | 1450 | 1451 | 1452 | 1453 | 1454 | 1455 | 1456 | 1457 | 1458 | 1459 | 1460 | 1461 | 1462 | 1463 | 1464 | 1465 | 1466 | 1467 | 1468 |
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|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-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Outline groups open – columns AT:CB

| | | Forecast Tool | | | | |
|-----------------|------------------|-------------------------------|----|----|-----|-----|
| Estimated Usage | | Forecast Period Usage (Weeks) | | | | |
| Quantity | Interval (weeks) | 13 | 26 | 52 | 260 | 520 |
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[illegible]

MMAPS

PROPRIETARY SPARE PARTS AND INVENTORY NEEDS ANALYSIS

ASSOCIATED DROP DOWN LISTS

| OEM (Insert codes and names) | | SUPPLIER (Insert codes and names) | | INVENTORY CLASSIFICATION | | LIKLIHOOD OF NEED | | STOCK LEVEL SHORTFALL RISK | | FREQUENCY / INTERVAL | |
|------------------------------|------|-----------------------------------|------|--------------------------|-----------------------------|-------------------|-------------|----------------------------|-------------|----------------------|------------------------|
| CODE | NAME | CODE | NAME | CODE | DESCRIPTION | CODE | DESCRIPTION | CODE | DESCRIPTION | Hrs | Period Description |
| | | | | SAR | Sub-assembly repairable | 1 | Low | 1 | Low | 40 | 40 Hr Week |
| | | | | SANR | Sub-assembly not repairable | 2 | Medium | 2 | Medium | 80 | 40 Hr/W Fortnight |
| | | | | SAI | Sub-assembly insurance | 3 | High | 3 | High | 160 | 40 Hr/W Month |
| | | | | SPC | Spare part consumable | | | | | 320 | 40 Hr/W 2-Month |
| | | | | SPR | Spare part repairable | | | | | 480 | 40 Hr/W 3-Month |
| | | | | SPNR | Spare part not repairable | | | | | 640 | 40 Hr/W 4-Month |
| | | | | SPI | Spare part insurance | | | | | 960 | 40 Hr/W 6-Month |
| | | | | | | | | | | 2080 | 40 Hr/W Year |
| | | | | | | | | | | 3120 | 40 Hr/W 18-Month |
| | | | | | | | | | | 4160 | 40 Hr/W 2-Year |
| | | | | | | | | | | 6240 | 40 Hr/W 3-Year |
| | | | | | | | | | | 8320 | 40 Hr/W 4-Year |
| | | | | | | | | | | 10400 | 40 Hr/W 5-Year |
| | | | | | | | | | | 20800 | 40 Hr/W 10-Year |
| | | | | | | | | | | 168 | 24 Hr/D Week |
| | | | | | | | | | | 336 | 24Hr/D Fortnight |
| | | | | | | | | | | 720 | 24 Hr/D Month (30D) |
| | | | | | | | | | | 1440 | 24 Hr/D 2-Month (30D) |
| | | | | | | | | | | 2160 | 24 Hr/D 3-Month (30D) |
| | | | | | | | | | | 2880 | 24 Hr/D 4-month (30D) |
| | | | | | | | | | | 4320 | 24 Hr/D 6-Month (30D) |
| | | | | | | | | | | 8760 | 24 Hr/D Year (365D) |
| | | | | | | | | | | 13080 | 24 Hr/D 18-Month |
| | | | | | | | | | | 17520 | 24 Hr/D 2-Year (365D) |
| | | | | | | | | | | 26280 | 24 Hr/D 3-Year (365D) |
| | | | | | | | | | | 35040 | 24 Hr/D 4-Year (365D) |
| | | | | | | | | | | 43800 | 24Hr/D 5-Year (365D) |
| | | | | | | | | | | 87600 | 24 Hr/D 10-Year (365D) |

| FREQUENCY / INTERVAL | | | |
|----------------------|-------------------|-------|------------------------|
| Hrs | Period | Hrs | Period |
| 40 | 40 Hr Week | 168 | 24 Hr/D Week |
| 80 | 40 Hr/W Fortnight | 336 | 24Hr/D Fortnight |
| 160 | 40 Hr/W Month | 720 | 24 Hr/D Month (30D) |
| 320 | 40 Hr/W 2-Month | 1440 | 24 Hr/D 2-Month (30D) |
| 480 | 40 Hr/W 3-Month | 2160 | 24 Hr/D 3-Month (30D) |
| 640 | 40 Hr/W 4-Month | 2880 | 24 Hr/D 4-month (30D) |
| 960 | 40 Hr/W 6-Month | 4320 | 24 Hr/D 6-Month (30D) |
| 2080 | 40 Hr/W Year | 8760 | 24 Hr/D Year (365D) |
| 3120 | 40 Hr/W 18-Month | 13080 | 24 Hr/D 18-Month |
| 4160 | 40 Hr/W 2-Year | 17520 | 24 Hr/D 2-Year (365D) |
| 6240 | 40 Hr/W 3-Year | 26280 | 24 Hr/D 3-Year (365D) |
| 8320 | 40 Hr/W 4-Year | 35040 | 24 Hr/D 4-Year (365D) |
| 10400 | 40 Hr/W 5-Year | 43800 | 24Hr/D 5-Year (365D) |
| 20800 | 40 Hr/W 10-Year | 87600 | 24 Hr/D 10-Year (365D) |

Maintenance Management Review Process

Slide 2: Review Process Overview

Slide 3: Review Process Flow Chart

Slide 4: Maintenance Mission

Slide 5: Maintenance Service Delivery Model (Simplified)

Slide 6: Maintenance Service Delivery Model (Detailed)

Slide 7: Review Questionnaire (1/3)

Slide 8: Review Questionnaire (2/3)

Slide 9: Review Questionnaire (3/3)

Slide 10: Worksheet '7. Review Form-Notes and Scores (Data Entry)' *(image)*

Slide 11: Worksheet '8. Review Form-Scores (Auto)' *(image)*

Slide 12: Worksheet '10. Review Charts (Auto) (1/3)' *(image)*

Slide 13: Worksheet '10. Review Charts (Auto) (2/3)' *(image)*

Slide 14: Worksheet '10. Review Charts (Auto) (3/3)' *(image)*

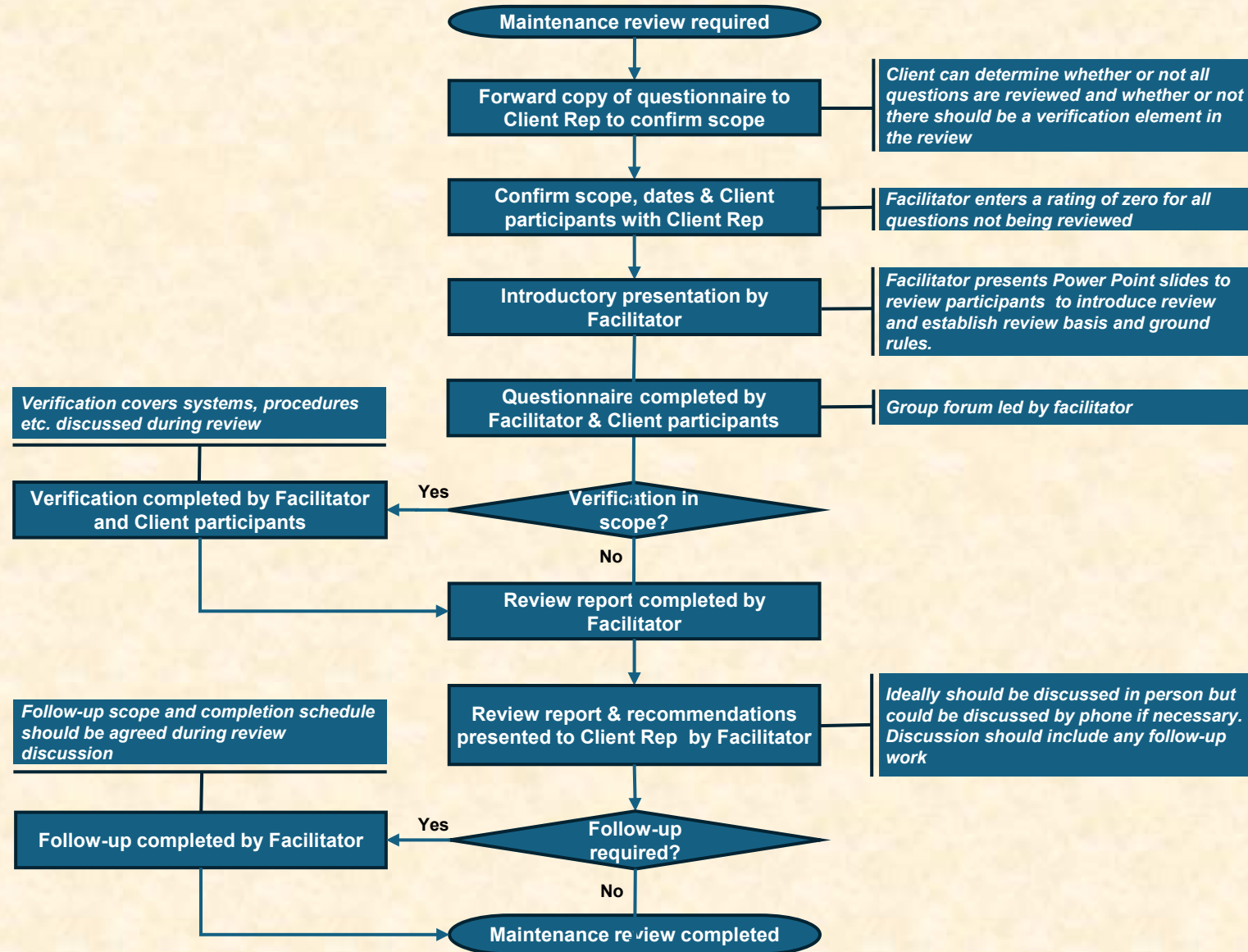
Slide 15: Typical Maintenance Work Control Process

(Simplified, included for review discussion purposes)

REVIEW PROCESS OVERVIEW

- ❑ The main goal of the review should be to evaluate the effectiveness of existing maintenance systems and processes in a structured manner and identify improvement opportunities.
- ❑ High level desktop reviews without a verification element are less likely to produce optimum outcomes
- ❑ Maintenance systems and processes may vary according to location, scale and operating environment yet still be effective in delivering appropriate outcomes.
- ❑ The achievement of optimum review outcomes depends on effective coordination and communication together with the cooperation, openness, willingness and commitment by those involved. Review processes should therefore be collaborative and non-confrontational.
- ❑ Review needs to be well planned for expectations to be met and the following aspects need appropriate consideration.
 - Goals and expectations must be clear
 - Scope needs to be clearly defined and aligned with goals and expectations
 - Timetable
 - Participants
 - Facilities
 - Reporting requirements
- ❑ Review process exposes participants to best practice maintenance management concepts.

REVIEW PROCESS FLOW CHART

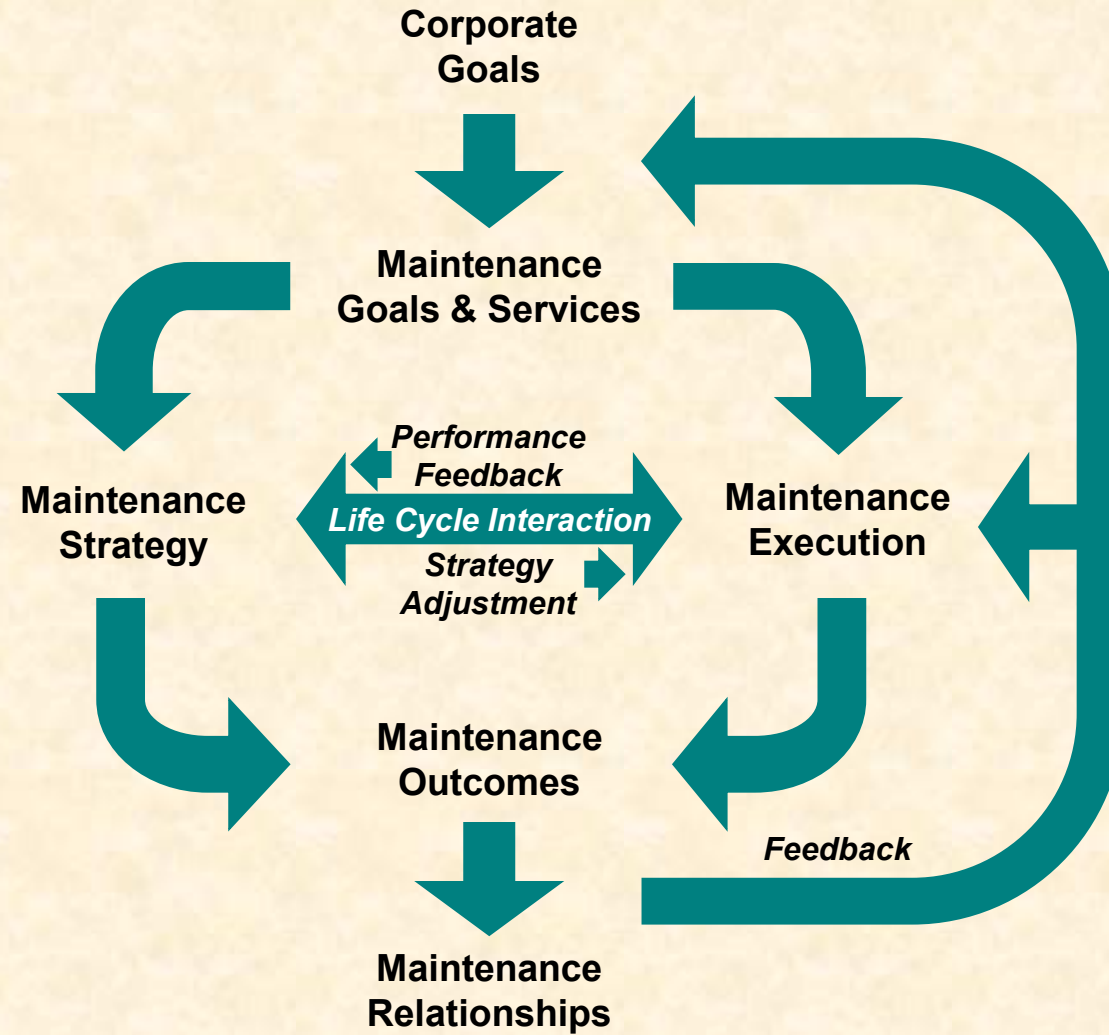


MAINTENANCE MISSION*The maintenance mission involves:*

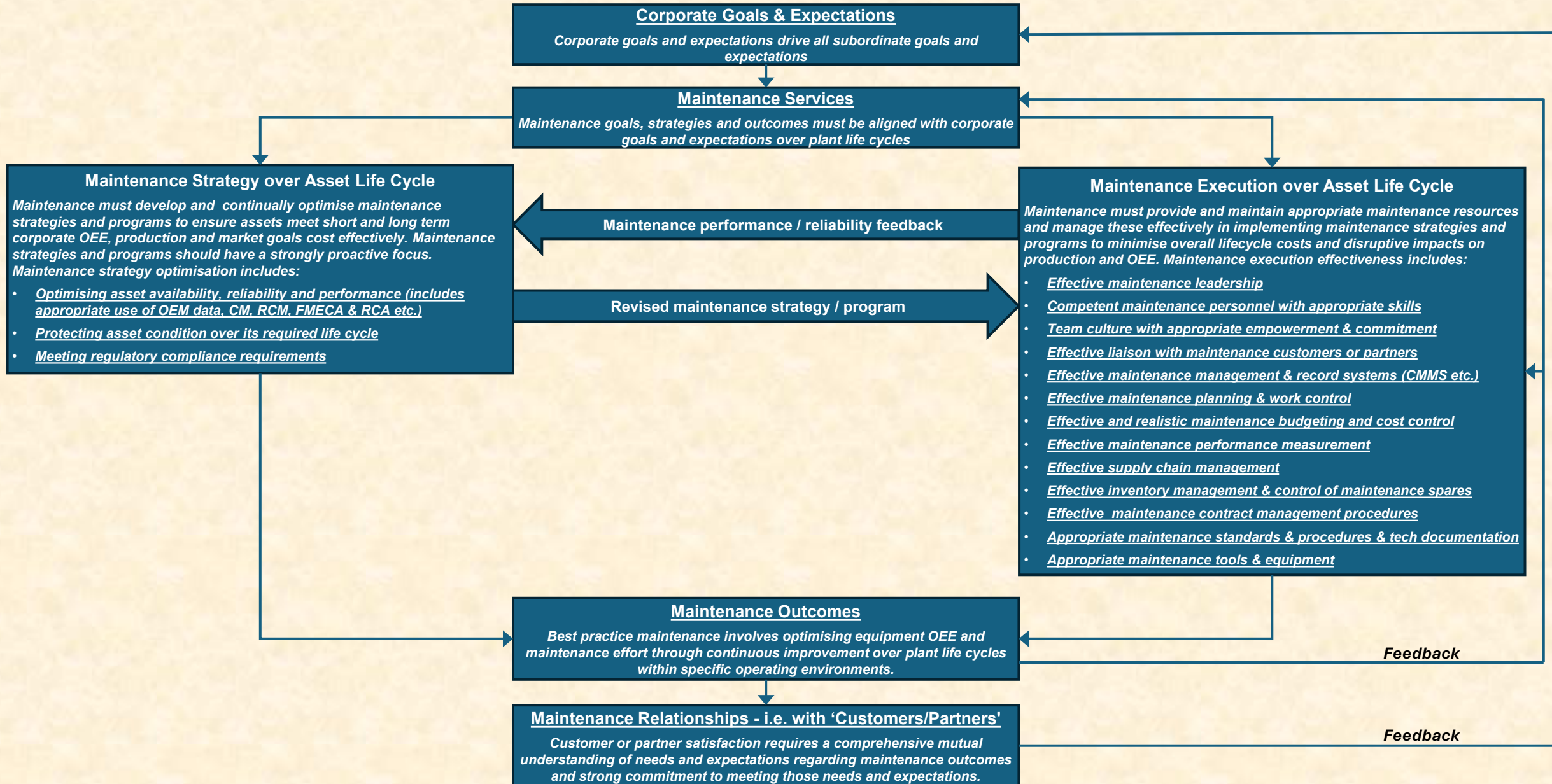
- ❑ Developing and continually optimising plant maintenance strategies and programs to ensure the achievement of short-term and long-term marketing and production strategies and objectives effectively and safely. This includes:
 - Optimising equipment availability, reliability & performance
 - Protecting asset condition over its required life cycle

- ❑ Providing and maintaining appropriate maintenance resources and managing them effectively and safely in implementing the required maintenance strategies and programmes to minimise overall life cycle costs and disruptive impacts on OEE and production.

MAINTENANCE SERVICE DELIVERY MODEL (SIMPLIFIED)



MAINTENANCE SERVICE DELIVERY MODEL (DETAILED)



QUESTIONNAIRE (1/3) (questions are contextual to question groups / subgroups)

| | | | |
|------------|---|------------|---|
| 1.0 | Operational Strategy | 3.0 | Maintenance Execution |
| 1.1 | Corporate Goals & Expectations | 3.1 | Leadership & Organisation |
| 1.1.1 | Have corporate goals and expectations been defined clearly? | 3.1.1 | Is the maintenance organisation structure appropriate and effective? |
| 1.1.2 | Are corporate goals and expectations appropriate and understood by all? | 3.1.2 | Are accountabilities and authorities appropriate and clearly defined? |
| | | 3.1.3 | Do team leaders consistently demonstrate commitment and lead by example? |
| 1.2 | Maintenance Service Goals & Strategies | 3.1.4 | Do team leaders support their teams effectively? |
| 1.2.1 | Have maintenance service goals and strategies been defined clearly? | 3.1.5 | Do team leaders communicate effectively and consistently? |
| 1.2.2 | Have maintenance service goals and strategies been clearly conveyed to all team members? | 3.1.6 | Do team leaders coach their personnel effectively and consistently? |
| 1.2.3 | Are maintenance service goals and strategies aligned with corporate goals and expectations? | | |
| 2.0 | Maintenance Strategy | 3.2 | Personnel & Skills |
| 2.1 | Asset Availability | 3.2.1 | Are maintenance staff levels appropriate? |
| 2.1.1 | Is asset availability monitored and optimised effectively? | 3.2.2 | Is the staff/contractor ratio appropriate? |
| 2.1.2 | Are asset availability data records appropriate and readily accessible? | 3.2.3 | Are maintenance personnel competent in all key areas? |
| 2.1.3 | Are asset availability analysis methods appropriate and effective? | 3.2.4 | Are skills assessed and training needs identified effectively and regularly? |
| | | 3.2.5 | Do training programmes reflect priorities identified by training needs analysis? |
| 2.2 | Asset Reliability | 3.2.6 | Is training effectiveness and associated personnel competence assessed? |
| 2.2.1 | Is asset reliability monitored & optimised effectively? | 3.2.7 | Is individual performance assessed regularly? |
| 2.2.2 | Are asset reliability data records appropriate and readily accessible? | | |
| 2.2.3 | Are asset reliability analysis methods and techniques appropriate and effective? | 3.3 | Culture |
| 2.2.4 | Is failure analysis and improvement action always timely and effective? | 3.3.1 | Is the level of teamwork satisfactory, do team members support the team & each other? |
| | | 3.3.2 | Are levels of empowerment appropriate? |
| 2.3 | Asset Performance | 3.3.3 | Is there a strong, consistent focus on continuous improvement and 'no-blame'? |
| 2.3.1 | Is critical asset performance monitored & optimised effectively? | 3.3.4 | Have the overall maintenance team values been defined? |
| 2.3.2 | Are asset performance data records appropriate and readily accessible? | 3.3.5 | Is there widespread commitment to maintenance team values? |
| 2.3.3 | Are asset performance analysis methods and techniques appropriate and effective? | | |
| 2.3.4 | Is corrective action always timely and effective? | 3.4 | Interface with Customers / Partners |
| | | 3.4.1 | Are mechanisms for maintenance/customer/partner interaction appropriate & effective? |
| 2.4 | Asset Protection | | |
| 2.4.1 | Is asset condition monitored & protected effectively? | 3.5 | Management & Record Systems (CMMS etc.) |
| 2.4.2 | Are asset condition data records appropriate and readily accessible? | 3.5.1 | Have appropriate maintenance management systems been established? |
| 2.4.3 | Is corrective action always timely and effective? | 3.5.2 | Have appropriate MMS / CMMS conventions been established effectively? |
| | | 3.5.3 | Has an effective asset hierarchy structure been established for all plant areas? |
| 2.5 | Regulatory Compliance | 3.5.4 | Has key asset data been defined and established effectively in MMS / CMMS? |
| 2.5.1 | Have all statutes and regulations relevant to asset maintenance been identified? | 3.5.5 | Has an effective technical documentation management system been established? |
| 2.5.2 | Do maintenance strategies effectively address all relevant compliance requirements? | 3.5.6 | Is interaction between MMS / CMMS and technical documentation systems effective? |
| 2.5.3 | Has compliance been achieved in all relevant areas? | 3.5.7 | Has an effective maintenance records management system been established? |
| | | 3.5.8 | Is interaction between MMS / CMMS and maintenance records systems effective? <i>(continued)</i> |

QUESTIONNAIRE (2/3) (questions are contextual to question groups / subgroups)

| | | | |
|------------|---|------------|---|
| 3.5.9 | Has an effective personnel records management system been established? | 3.6.16 | Is hazard management planning integrated with work order planning effectively? |
| 3.5.10 | Have effective inventory management systems and procedures been established? | 3.6.17 | Is the generation of SPLs during work order planning satisfactory? |
| 3.5.11 | Is interaction between MMS / CMMS and supply chain management systems effective? | 3.6.18 | Is the reservation of materials during work order planning satisfactory? |
| 3.5.12 | Is interaction between MMS / CMMS and financial systems effective? | 3.6.19 | Is coordination between maintenance and operations during work planning effective? |
| 3.5.13 | Are all aspects of work requests / work orders actioned effectively using MMS / CMMS? | 3.6.20 | Are work order costs estimated appropriately and consistently prior to implementation? |
| 3.5.14 | Are all aspects of goods & services requisitioning / procurement actioned effectively using MMS / CMMS? | 3.6.21 | Are work orders approved consistently and appropriately prior to implementation? |
| 3.5.15 | Have asset BOMs been defined and established in MMS / CMMS? | 3.6.22 | Are work orders covering multiple equipment items, handled effectively by MMS / CMMS? |
| 3.5.16 | Is MMS / CMMS used effectively for developing budgets? | | |
| 3.5.17 | Is MMS / CMMS report generation satisfactory? | 3.7 | Work Control |
| 3.5.18 | Does MMS / CMMS user friendliness and performance meet user needs in all key aspects? | 3.7.1 | Are periodic work plans implemented consistently and effectively with regular progress updates? |
| 3.5.19 | Has all appropriate MMS / CMMS functionality been fully and effectively utilised? | 3.7.2 | Is coordination between maintenance & operations consistently effective? |
| 3.5.20 | Are MMS / CMMS users competent in its use and is MMS / CMMS accessibility satisfactory? | 3.7.3 | Is coordination between maintenance & engineering support consistently effective? |
| 3.5.21 | Are MMS / CMMS work records consistently satisfactory? | 3.7.4 | Is permit issue coordinated effectively and consistently to minimise work delays? |
| 3.5.22 | Can maintenance work details, labour and spares records be retrieved & analysed effectively? | 3.7.5 | Have inventory systems been optimised to minimise work delays consistently? |
| 3.5.23 | Is interaction between MMS / CMMS & supply chain systems re spares usage effective? | 3.7.6 | Have procurement systems been optimised to minimise work delays consistently? |
| 3.5.24 | Is maintenance failure data available, retrieved & analysed effectively? | 3.7.7 | Have maintenance tools & equipment systems been optimised to minimise work delays? |
| 3.5.25 | Is interaction between MMS / CMMS & other maintenance record systems effective? | 3.7.8 | Are labour man-hrs recorded effectively? |
| 3.5.26 | Are filing systems for hard copy records catalogued & managed effectively? | 3.7.9 | Is lost or non-productive time recorded effectively and consistently? |
| 3.5.27 | Do maintenance records meet regulatory compliance requirements? | 3.7.10 | Are work orders closed out effectively and consistently without undue delay? |
| | | 3.7.11 | Is the level of rework acceptable? |
| 3.6 | Planning | 3.7.12 | Is the level of rework recorded effectively? |
| 3.6.1 | Is all non-urgent work planned appropriately and effectively? | | |
| 3.6.2 | Is the proactive / reactive work ratio satisfactory? | 3.8 | Budgets & Cost Control |
| 3.6.3 | Is the maintenance backlog satisfactory? | 3.8.1 | Are budget and cost control accountabilities devolved appropriately and effectively through the maintenance team? |
| 3.6.4 | Does maintenance planning keep pace with work request / work order generation? | 3.8.2 | Are budgets zero based? |
| 3.6.5 | Is planning consistently effective (e.g..estimated versus actual)? | 3.8.3 | Is MMS / CMMS used effectively in budget development? |
| 3.6.6 | Are periodic work plans reflecting operations & maintenance priorities used consistently? | 3.8.4 | Is MMS / CMMS used effectively for cost control and reporting? |
| 3.6.7 | Are short, medium and long-term work plans employed effectively? | 3.8.5 | Has account coding been optimised? |
| 3.6.8 | Are maintenance projects such as shutdowns planned effectively? | 3.8.6 | Are maintenance costs reviewed regularly? |
| 3.6.9 | Is interaction between MMS / CMMS and project planning systems effective? | | |
| 3.6.10 | Have PM work orders & SPLs been established in MMS / CMMS for all relevant assets? | 3.9 | Performance |
| 3.6.11 | Have CM work orders been established in MMS / CMMS for all relevant assets? | 3.9.1 | Is maintenance performance regularly and effectively monitored and reported using KPIs? |
| 3.6.12 | Is the linking of supplementary documentation to work orders satisfactory? | 3.9.2 | Are KPIs appropriate? |
| 3.6.13 | Is access to asset data during work planning satisfactory? | 3.9.3 | Is all KPI supporting data accurate, timely and readily accessible? |
| 3.6.14 | Is access to materials data during work planning satisfactory? | | |
| 3.6.15 | Is access to maintenance standards & procedures during work planning satisfactory? | | |

QUESTIONNAIRE (3/3) (questions are contextual to question groups / subgroups)**3.10 Supply Chain**

- 3.10.1 Is the procurement of goods and services timely and cost effective?
- 3.10.2 Do all requisitions include appropriate specifications, inspection and delivery requirements?
- 3.10.3 Is invoice matching and approval of accounts for payment timely and effective?
- 3.10.4 Are there supply agreements in place to assist in minimising inventory levels?
- 3.10.5 Has supply chain been effectively and appropriately optimised re materials pricing, delivery, quality and inventory level?
- 3.10.6 Is test documentation for incoming goods managed effectively?

3.11 Inventory Management

- 3.11.1 Are inventory levels monitored / adjusted in line with logistics issues and OEE targets?
- 3.11.2 Has inventory been catalogued effectively with full OEM procurement specifications, appropriate asset cross-referencing and accurate stock locations etc.?
- 3.11.3 Is inventory managed effectively to minimise stock losses / deterioration and stock issue delays?
- 3.11.4 Are there any unofficial satellite stocks?
- 3.11.5 Are refurbishable / rotatable spares managed effectively to optimise availability?

3.12 Contract Management

- 3.12.1 Are maintenance contracts managed effectively re time, cost, quality?
- 3.12.2 Are there effective tendering / contract management procedures and documentation in use?
- 3.12.3 Are contract / contractor payments administered within the MMS / CMMS?
- 3.12.4 Are contract management records controlled and managed effectively?
- 3.12.5 Do contractual disputes occur more frequently than necessary?

3.13 Documentation

- 3.13.1 Is documentation controlled and managed effectively?
- 3.13.2 Is documentation readily accessible?
- 3.13.3 Is documentation appropriate and complete?
- 3.13.4 Is documentation accurate and up to date?
- 3.13.5 Does documentation meet regulatory compliance requirements?

3.14 Standards, Specifications & Procedures

- 3.14.1 Are standards, specifications and procedures controlled and managed effectively?
- 3.14.2 Are standards, specifications and procedures readily accessible?
- 3.14.3 Are standards, specifications and procedures appropriate and sufficiently detailed?
- 3.14.4 Are standards, specifications and procedures accurate and up to date?
- 3.14.5 Do standards, specifications and procedures meet regulatory compliance needs?

3.15 Tools & Equipment

- 3.15.1 Are tools and equipment controlled and managed effectively?
- 3.15.2 Are tools and equipment readily accessible?
- 3.15.3 Are tools and equipment appropriate (fit for purpose) and in good condition?
- 3.15.4 Are tools and equipment quantities sufficient?

4.0 Maintenance Outcomes

- 4.0.1 Is asset OEE being optimised effectively?
- 4.0.2 Is continuous improvement used effectively to identify maintenance improvement opportunities?
- 4.0.3 Are maintenance corrective actions consistently effective and timely?
- 4.0.4 Is maintenance budgeting and cost control consistently effective?
- 4.0.5 Are assets being protected effectively?
- 4.0.6 Are regulatory compliance requirements being met effectively and consistently?

5.0 Maintenance Customers / Partners

- 5.0.1 Is there strong commitment by maintenance to meeting customer / partner expectations?
- 5.0.2 Is there strong commitment by customers / partners to meeting maintenance expectations?
- 5.0.3 Are customer / partner relationships managed effectively with effective two-way interaction?
- 5.0.4 Is there consistently good alignment between maintenance and operations objectives?
- 5.0.5 How good are relationships with key customers / partners at present?

Review Question Response Rating System*1 = Ineffective or doesn't exist**2 = Significant improvement required; minimum needs met**3 = Some improvement required; most needs met**4 = Satisfactory, needs met fully**0 = Not assessed***Abbreviations:****MMS** = Manual and/or partially integrated computerised maintenance management system**CMMS** = Integrated, computerised maintenance management system**OEE** = Overall Equipment Effectiveness **PM** = Preventive Maintenance **CM** = Condition Monitoring**BOMs** = Bills of Materials **SPLs** = Service Parts Lists **OEM** = Original Equipment Manufacturer

WORKSHEET '7. REVIEW FORM-NOTES AND SCORES (DE)'

| | A | B | C | D | E | F | G | H |
|----|--|--|---|---------------------------------|--------------------------|------------|--------|---|
| 1 | MMAPS | | | | | | | |
| 2 | Maintenance Management Review Form (with notes, comments & scores) | | | | | Review ID: | | |
| 3 | Rating: 1 = Ineffective or doesn't exist, 2 = Significant improvement required, minimum needs met, | | | | | Reviewer: | | |
| 4 | 3 = Some improvement required, most needs met, 4 = Satisfactory, meets needs fully, 0 = Not assessed | | | | | | | |
| 5 | Issue # | Functional Groups & Subgroups | Questions <i>Contextual to Functional Groups / Subgroups</i> | Techniques & / or Systems Used: | Gaps Perceived by Users: | Comments: | Rating | |
| 6 | | | | | | | | |
| 7 | 1.0 | Operational Strategy | | | | | | |
| 8 | 1.1 | Corporate Goals & Expectations | | | | | | |
| 9 | 1.1.1 | Corporate Goals & Expectations | Have corporate goals and expectations been defined clearly? | | | | | |
| 10 | 1.1.2 | Corporate Goals & Expectations | Are corporate goals and expectations appropriate and understood by all? | | | | | |
| 11 | 1.2 | Maintenance Service Goals & Strategies | | | | | | |
| 12 | 1.2.1 | Maintenance Service Goals & Strategies | Have maintenance service goals and strategies been defined clearly? | | | | | |

WORKSHEET '8. REVIEW FORM SCORES (AUTO)'

MMAPS

Maintenance Management Review Form (with scores, without notes / comments)

Review ID:

Date:

Rating: 1 = Ineffective or doesn't exist, 2 = Significant improvement required, minimum needs met,
3 = Some improvement required, most needs met, 4 = Satisfactory, meets needs fully, 0 = Not assessed

Note: Questions are contextual to Functional Groups and Subgroups**Rating****1.0 Operational Strategy****1.1 Corporate Goals & Expectations**

1.1.1 Have corporate goals and expectations been defined clearly?

0

1.1.2 Are corporate goals and expectations appropriate and understood by all?

0

1.2 Maintenance Service Goals & Strategies

1.2.1 Have maintenance service goals and strategies been defined clearly?

0

1.2.2 Have maintenance service goals and strategies been clearly conveyed to all team members?

0

1.2.3 Are maintenance service goals and strategies aligned with corporate goals and expectations?

0

2.0 Maintenance Strategy**2.1 Asset Availability**

2.1.1 Is asset availability monitored and optimised effectively?

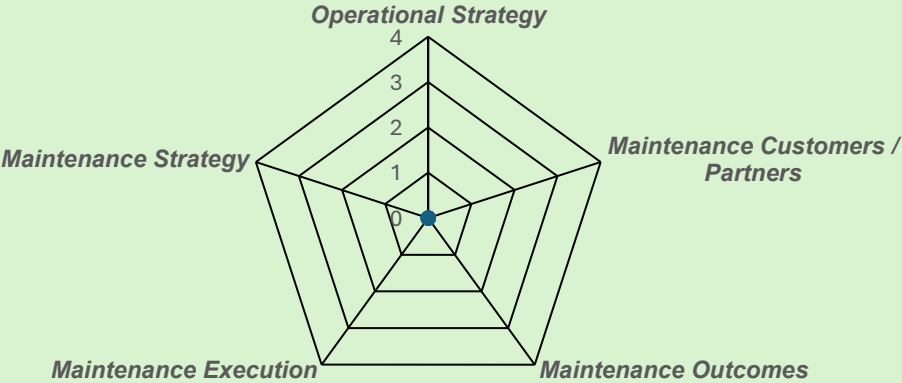
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2.1.2 Are asset availability data records appropriate and readily accessible?

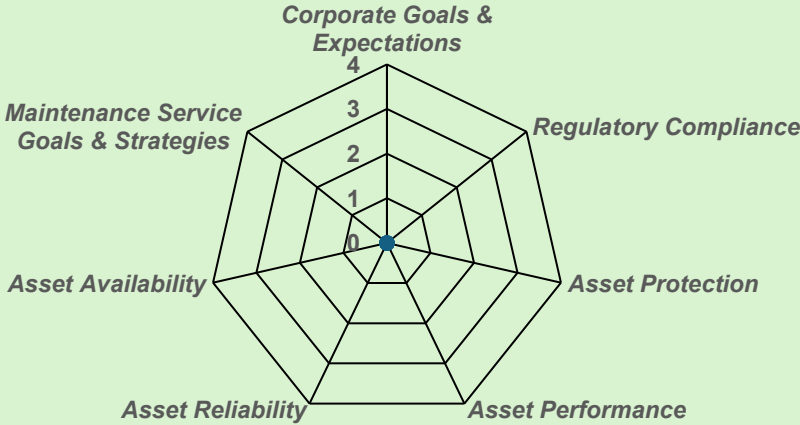
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REVIEW CHARTS (1/3)

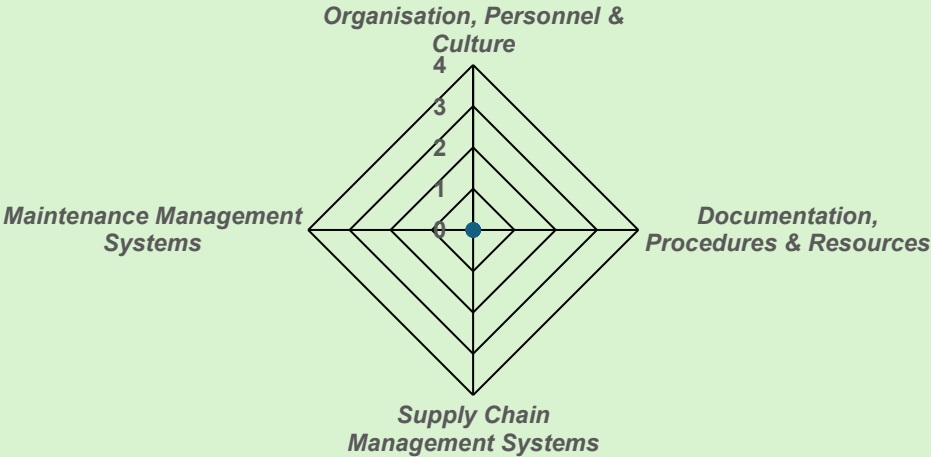
Overall Maintenance Effectiveness



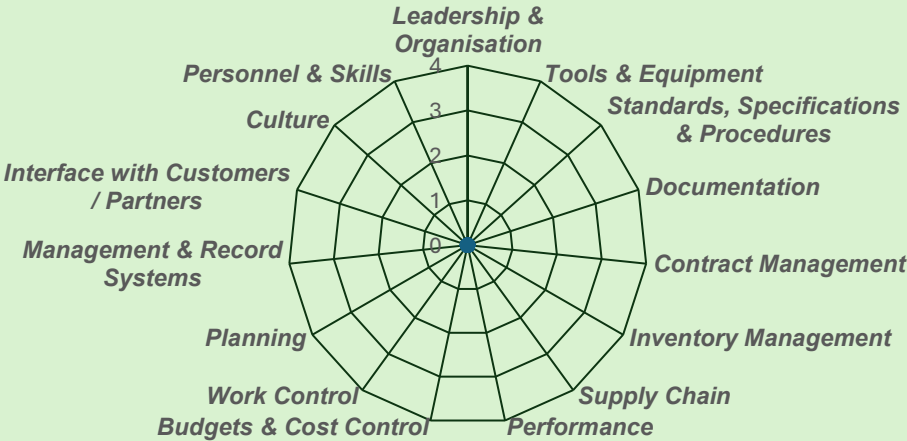
Operational & Maintenance Strategy



Maintenance Execution Overview

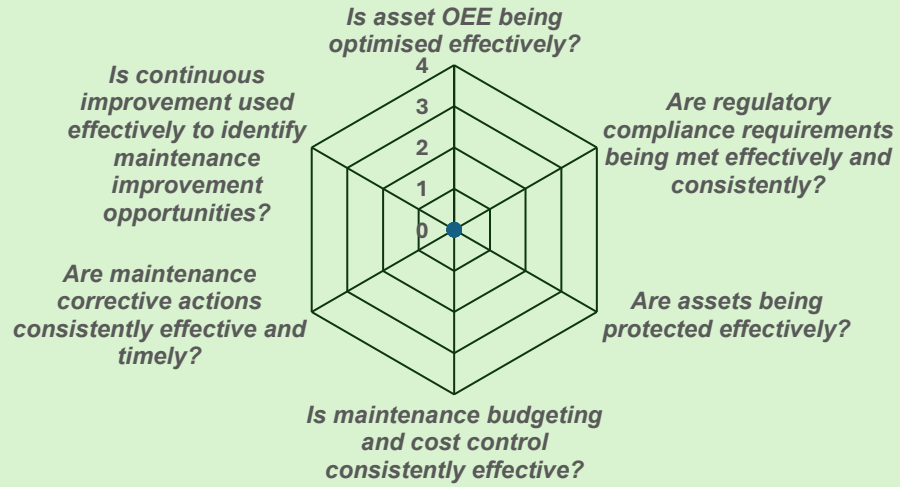


Maintenance Execution in Detail

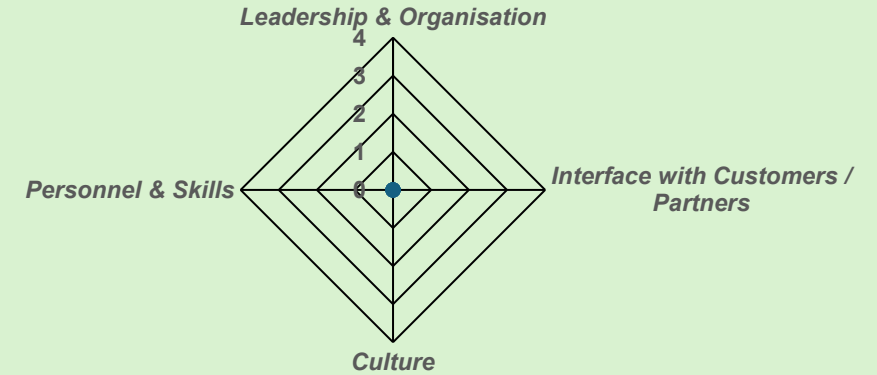


REVIEW CHARTS (2/3)

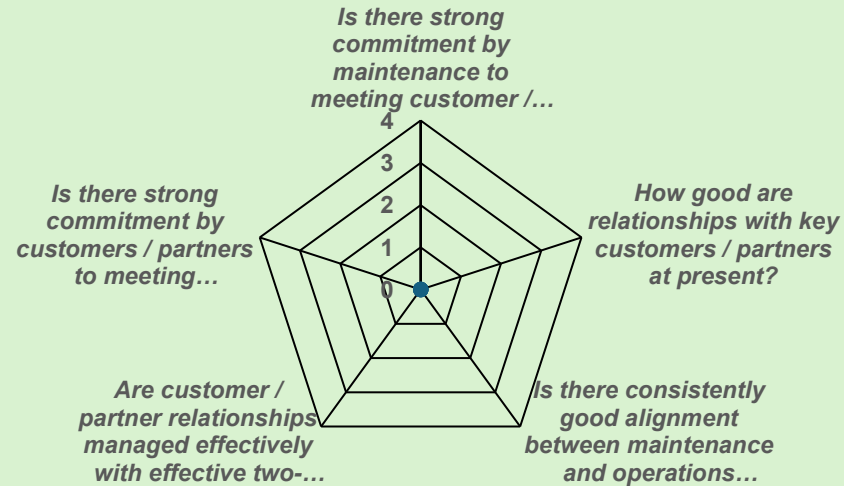
Maintenance Strategic Outcomes



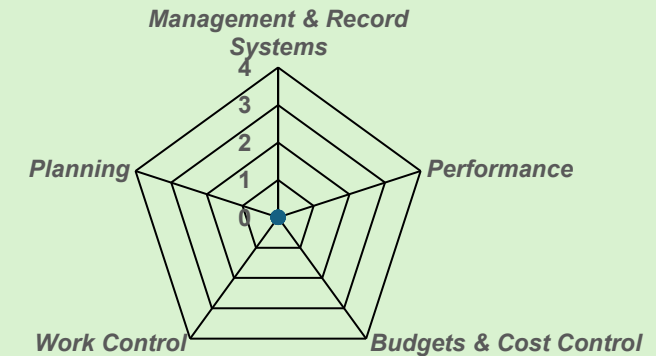
Maintenance Execution Organisation, Personnel & Culture



Maintenance Customer / Partner Relationships

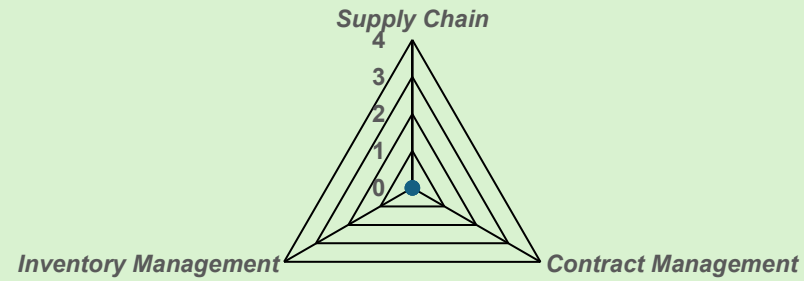


Maintenance Execution Maintenance Management Systems

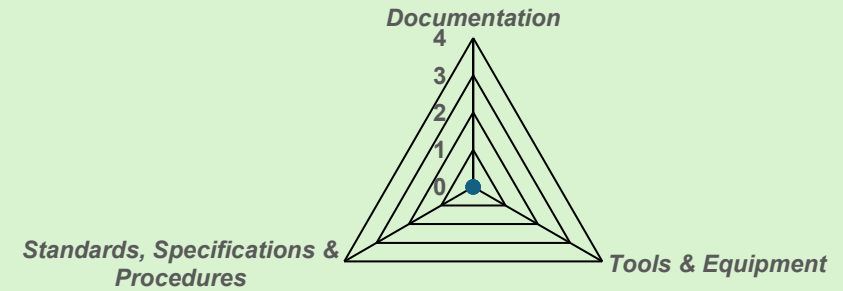


REVIEW CHARTS (3/3)

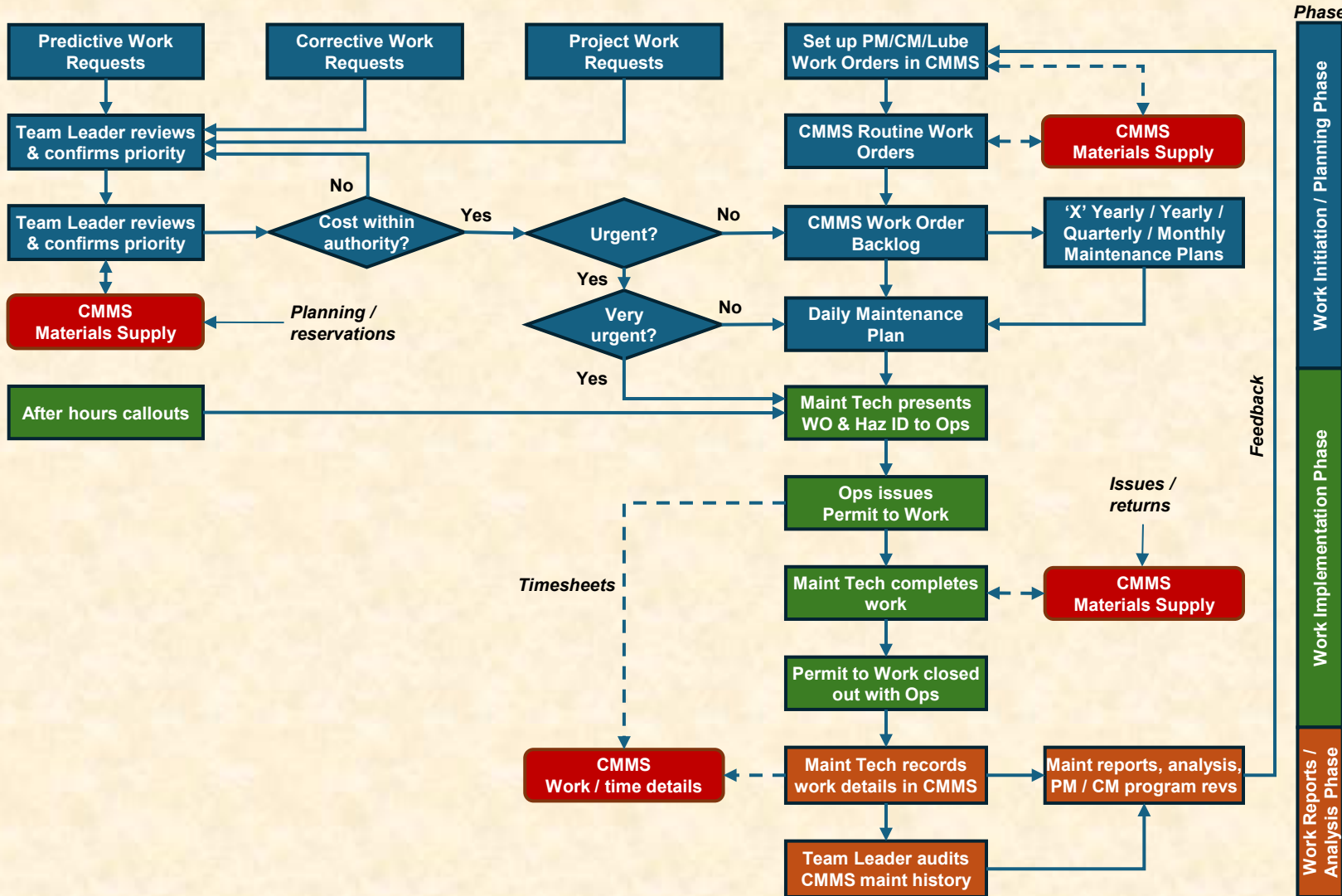
**Maintenance Execution
Supply Chain Management Systems**



**Maintenance Execution
Documentation, Procedures & Resources**



Simplified



MAINTENANCE TERMS

Proactive Maintenance (>70% of overall maintenance effort)

Prearranged, planned maintenance actions or work carried out to optimise equipment reliability, availability and performance or rectify known deterioration prior to the occurrence of any avoidable, undesirable or uncontrolled effect on production. Proactive maintenance includes on-condition tasks, condition monitoring, predictive maintenance and preventive maintenance.

Reactive Maintenance (<30% of overall maintenance effort)

Maintenance actions or work carried out in response to unplanned or unexpected events, including functional failures, potential failures, deterioration or breakdowns etc., which have avoidable, undesirable or uncontrolled effects on production.

Planned Maintenance (>90% of overall maintenance effort)

All maintenance actions or work, either proactive or reactive, for which appropriate planning and preparation has taken place. Planning may include breaking the task into logical steps, allocating resources to each step, arranging spares, interfacing with production, hazard identification and work scheduling etc.

Condition Monitoring (CM)

The use of analytical techniques to monitor equipment condition and obtain serviceability data over time so that reliability can be assessed and faults or deterioration (potential failures) detected and diagnosed prior to causing any uncontrolled effect on production.

These analytical techniques detect potential failure effects falling into the following groups: dynamic effects, particle effects, chemical effects, physical effects, temperature effects and electrical effects.

Predictive Maintenance or Condition Based Maintenance

Maintenance actions or work scheduled in response to condition monitoring predictions and diagnoses to optimise reliability and availability.

Preventive Maintenance (PM)

Maintenance actions or work carried out on a periodic basis to physically monitor equipment condition and/or rectify known equipment deterioration.

Corrective Maintenance

Maintenance actions or work carried out in response to failures, potential failures or deterioration etc. to correct defects and return equipment to acceptable condition.

BOW TIE RISK ANALYSIS

Slide 2: MMAPS Bow Tie Risk Analysis Worksheet Image

Slide 3: Associated Dropdown Lists

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MMAPS

BOW TIE RISK ANALYSIS

CLIENT:

JOB:

Date:

Type, Linkage Type, Likelihood, Severity and Effectiveness cells all have drop down lists

1 Conditional Formatting 5 Columns D,J,P,V

| Threats / Causes & Escalations | | | | | Threat / Cause & Escalation Barriers / Controls | | | | | Hazard / Top Event | Consequence & Escalation Barriers / Controls | | | | | Consequences & Escalations | | | | | | | |
|--------------------------------|-------------|------|------------|-----------|---|------|-------------|------|---------------|--------------------|--|--------------|--------------|-----------|---------------|----------------------------|-------------|----|--------------|-----------|----------|------|-------------|
| ID | Description | Type | Likelihood | Linked To | Linkage Type | ID | Description | Type | Effectiveness | | Linked To | Linkage Type | Linkage Type | Linked To | Effectiveness | Type | Description | ID | Linkage Type | Linked To | Severity | Type | Description |
| 7 | | | | | | 7.1 | | | | | | | | | | | 7.1 | | | | | | 7 |
| | | | | | | 7.2 | | | | | | | | | | | 7.2 | | | | | | |
| | | | | | | 7.3 | | | | | | | | | | | 7.3 | | | | | | |
| | | | | | | 7.4 | | | | | | | | | | | 7.4 | | | | | | |
| | | | | | | 7.5 | | | | | | | | | | | 7.5 | | | | | | |
| EX | | | | | | EXX | | | | | | | | | | | EXX | | | | | | EX |
| 8 | | | | | | 8.1 | | | | | | | | | | | 8.1 | | | | | | 8 |
| | | | | | | 8.2 | | | | | | | | | | | 8.2 | | | | | | |
| | | | | | | 8.3 | | | | | | | | | | | 8.3 | | | | | | |
| | | | | | | 8.4 | | | | | | | | | | | 8.4 | | | | | | |
| | | | | | | 8.5 | | | | | | | | | | | 8.5 | | | | | | |
| EX | | | | | | EXX | | | | | | | | | | | EXX | | | | | | EX |
| 9 | | | | | | 9.1 | | | | | | | | | | | 9.1 | | | | | | |
| | | | | | | 9.2 | | | | | | | | | | | 9.2 | | | | | | |
| | | | | | | 9.3 | | | | | | | | | | | 9.3 | | | | | | |
| | | | | | | 9.4 | | | | | | | | | | | 9.4 | | | | | | |
| | | | | | | 9.5 | | | | | | | | | | | 9.5 | | | | | | |
| EX | | | | | | EXX | | | | | | | | | | | EXX | | | | | | EX |
| 10 | | | | | | 10.1 | | | | | | | | | | | 10.1 | | | | | | 9 |
| | | | | | | 10.2 | | | | | | | | | | | 10.2 | | | | | | |
| | | | | | | 10.3 | | | | | | | | | | | 10.3 | | | | | | |
| | | | | | | 10.4 | | | | | | | | | | | 10.4 | | | | | | |
| | | | | | | 10.5 | | | | | | | | | | | 10.5 | | | | | | |
| EX | | | | | | EXX | | | | | | | | | | | EXX | | | | | | EX |

BOW TIE RISK ANALYSIS ASSOCIATED DROP DOWN LISTS

[illegible]

PROJECT PLANNING & RISK MANAGEMENT

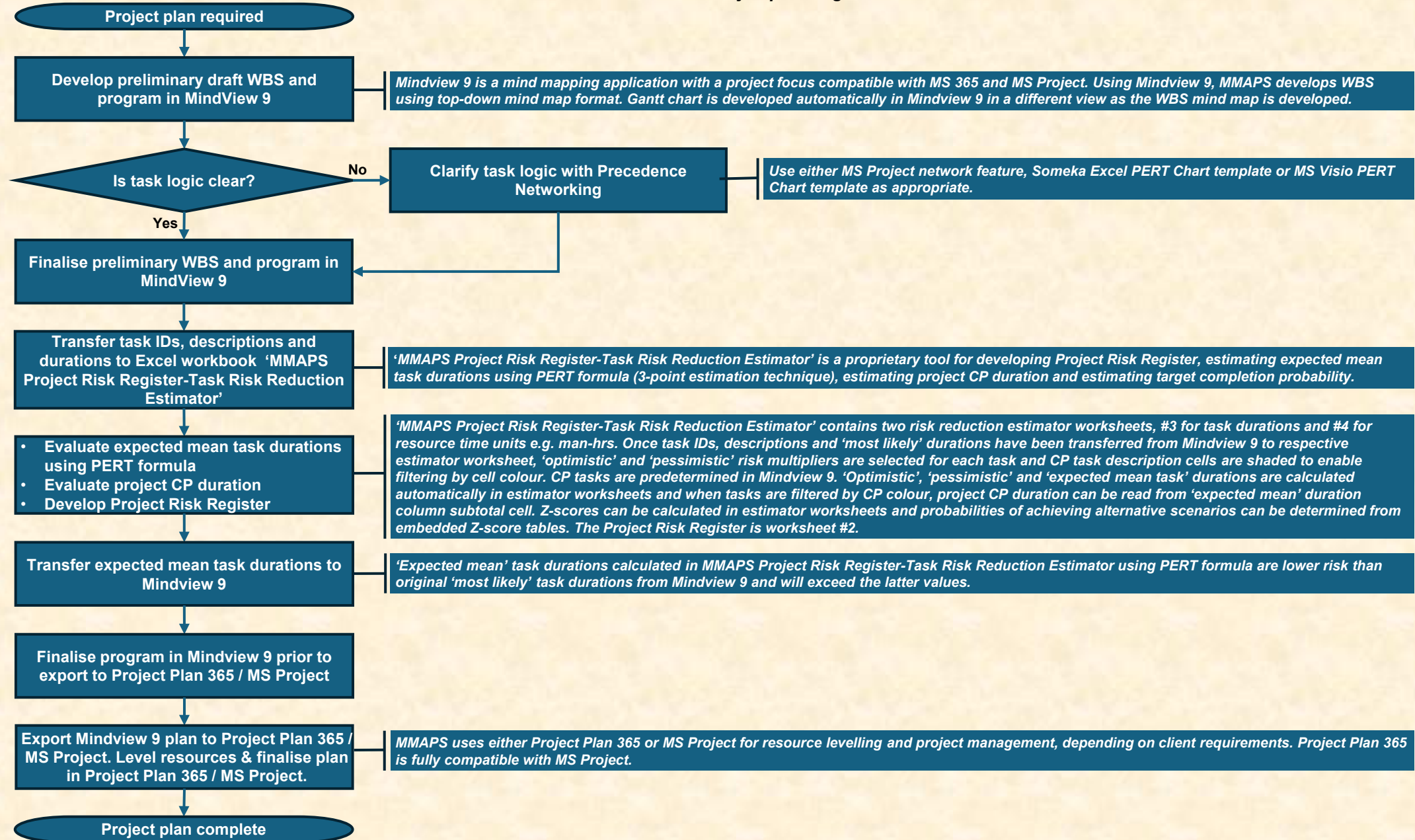
Slide 2: Overall Project Planning Process Flow Chart

Slide 3: Worksheet 2. Project Risk Register (*image*)


Slide 4: Worksheet 3. Task Duration Risk Reduction (*image*)

Slide 5: Worksheet 4. Task Resource Time Unit Risk Reduction (*image*)


Excludes detailed job planning



Worksheet 3. Task Duration Risk Reduction

| | | | | | | | | | | | | | | | |
|----|--|----------------------------------|------------------|------------------------------------|------------------------------------|--|---------------------------|--|--|---|-------------------------|--|------------------------|---|------|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O |
| 1 | MMAPS | | | | | | | | | | | | | | |
| 2 | PROJECT TASK DURATION RISK REDUCTION ESTIMATOR | | | | | | | | | | | | | | |
| 3 | Project: | | | | | | | | | | | Date: | | | |
| 4 | | Column cells with formula | | | | | | | | | | | | | |
| 5 | | Column cells with drop down list | | Print A4 portrait | | | | |  Embedded Info (double click icon) | | | | | | |
| 6 | | Associated WBS Task ID | Task Description | Task Duration (Weeks, Days, Hours) | | | | | | | | | | | |
| | | | | Task Duration Time Units W / D / H | Optimistic / Minimum Task Duration | Task Duration Risk Decrease Multiplier | Most Likely Task Duration | Task Duration Risk Increase Multiplier | Pessimistic / Maximum Task Duration | Expected Mean Task Duration with Risk Allowance - Unrounded | Task Standard Deviation | Expected Mean Task Duration with Risk Allowance - Manually Rounded | Task Duration Variance | | |
| 7 | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | |
| 9 | | | | | 0.00 | 0.90 | | | 1.50 | 0.00 | 0.00 | 0.00 | | | 0.00 |
| 10 | | | | | 0.00 | 0.90 | | | 1.50 | 0.00 | 0.00 | 0.00 | | | 0.00 |

Worksheet 4. Task Resource Time Unit Risk Reduction

| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P |
|----|---|----------------------------------|---|--|--|---|--|---|--|-------------------------|--|-----------------------------------|----------------------|---|--|------------------------------------|
| 1 | MMAPS | | | | | | | | | | | | | | | |
| 2 | PROJECT TASK RESOURCE TIME UNIT RISK REDUCTION ESTIMATOR | | | | | | | | | | | | | | | |
| 3 | Project: | | | | | | | | | | | Date: | | | | |
| 4 | | Column cells with formula | | | | | | | | | | | | | | |
| 5 | | Column cells with drop down list | | Print A4 portrait | | | |  Embedded Info (double click icon) | | | | | | | | |
| 6 | | | Task Resource Time Units (Man-hours, Man-days, Man-weeks) | | | | | | | | | | | | | |
| 7 | Associated WBS Task ID | Task Description | Task Resource Time Units MW / MD / MH | Optimistic / Minimum Task Resource Time Units | Task Resource Time Units Risk Decrease Multiplier | Most Likely Task Resource Time Units | Task Resource Time Units Risk Increase Multiplier | Pessimistic / Maximum Task Resource Time Units | Expected Mean Task Res Time Units with Risk Allowance - Unrounded | Task Standard Deviation | Expected Mean Task Res Time Units with Risk Allownc - Man Rounded | Task Resource Time Units Variance | No of Task Resources | Task Duration Based on No of Resources Unrounded | Task Duration Based on No of Resources - Manually Rounded | Task Duration Time Units W / D / H |
| 8 | | | | | | | | | | | | | | | | |
| 9 | | | | 0.00 | 0.90 | | 1.50 | 0.00 | 0.00 | 0.00 | | 0.00 | | | | |
| 10 | | | | 0.00 | 0.90 | | 1.50 | 0.00 | 0.00 | 0.00 | | 0.00 | | | | |

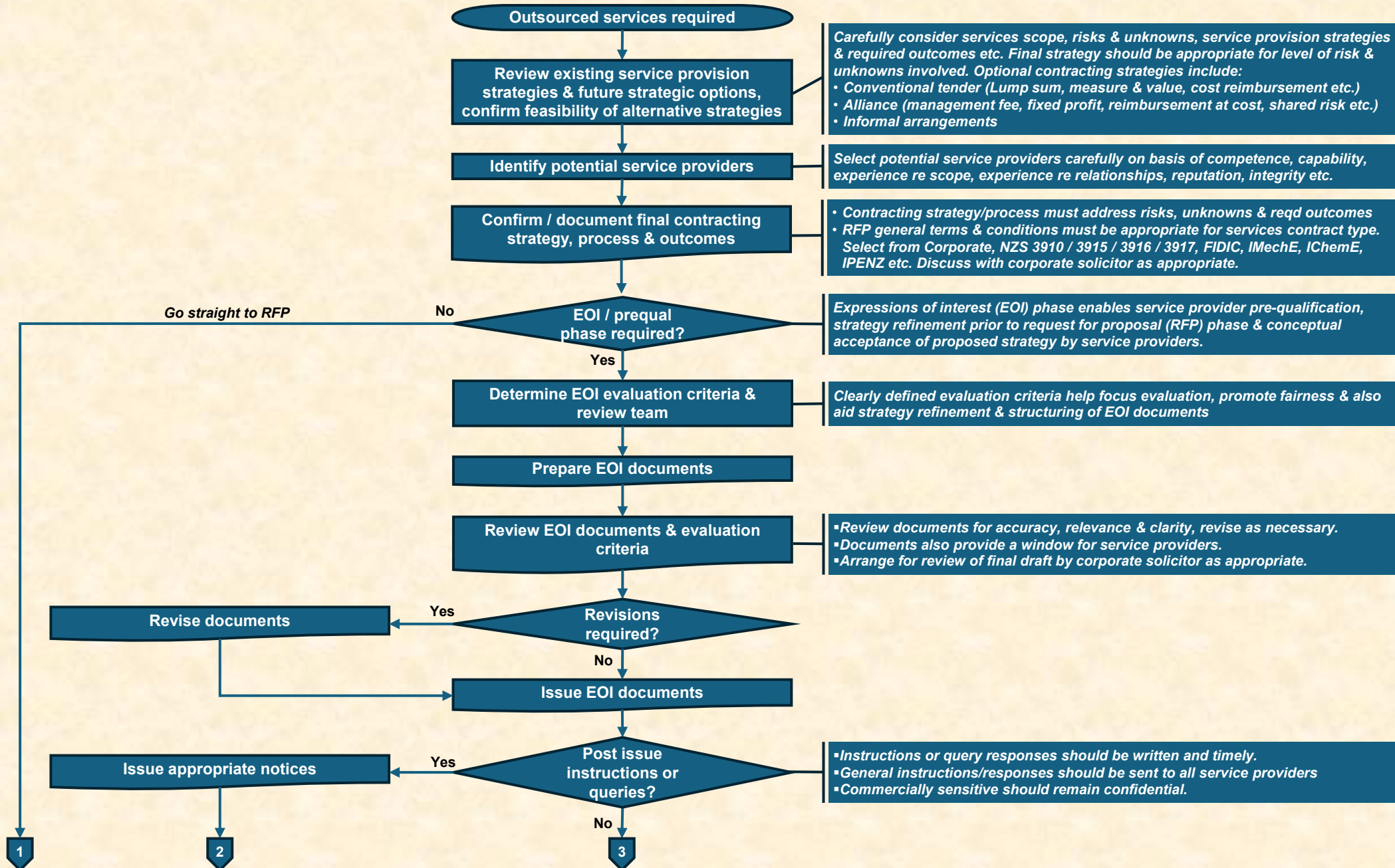
OUTSOURCED SERVICE CONTRACTS

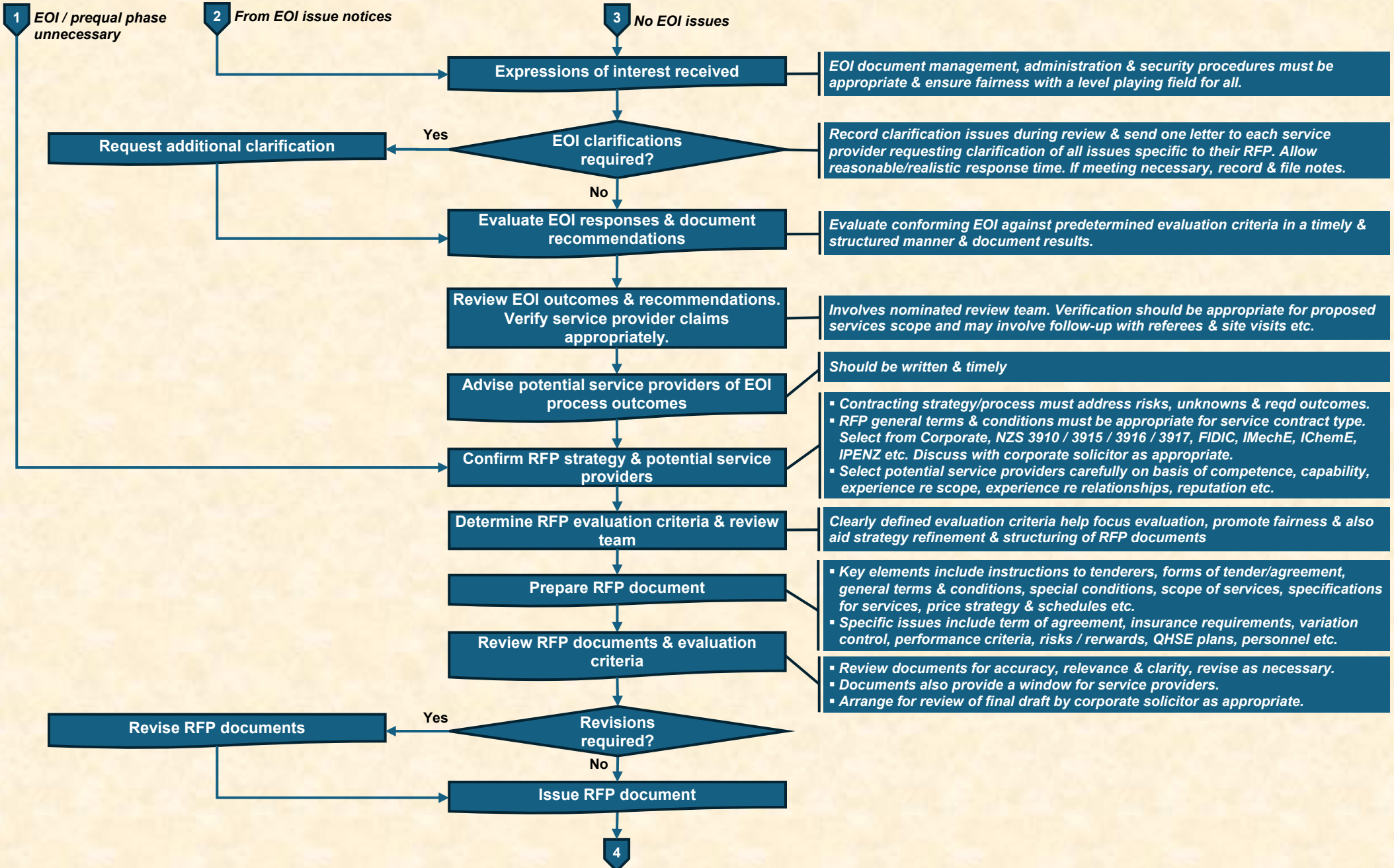
Slide 2: Some key hallmarks of successful outsourced service contracts

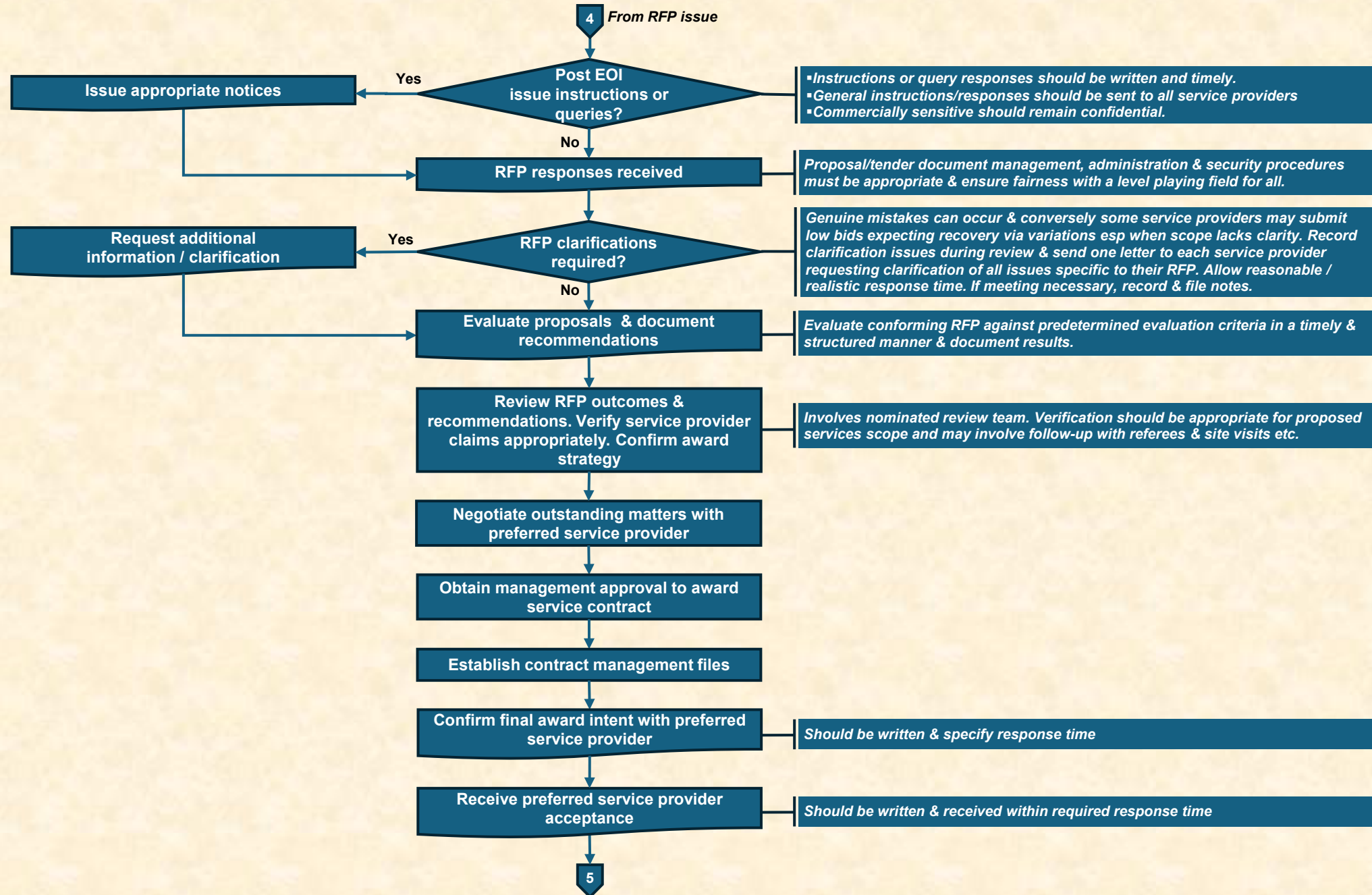
Slides 3-6: Continuous flow chart outlining all phases of development and establishment of outsourced service contracts

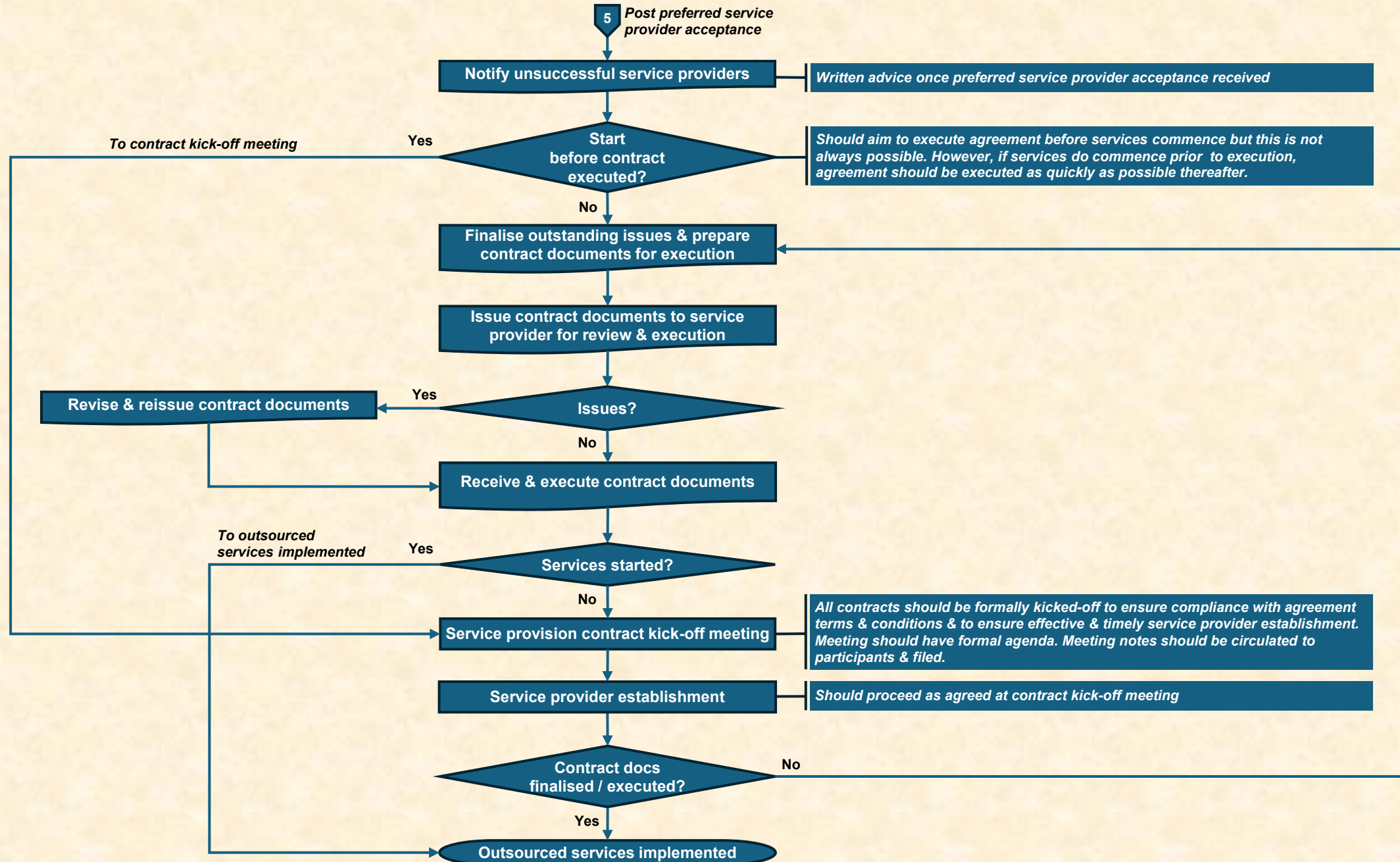
Some key hallmarks of successful outsourced service contracts:

- **Contracting strategy is clear, appropriate and understood by all**
- **Scope of services is clear, appropriately detailed and understood by all**
- **Specifications and delivery standards are clear, relevant, appropriate and understood by all**
- **Terms and conditions are appropriate and understood by all**
- **Risks are shared, clearly understood and minimised for each party**
- **Openness, honesty and trust are practiced consistently by all**
- **All parties are committed to win / win**









CONSTRUCTION CONTRACT QUALITY MANAGEMENT IN PROCESS PLANTS - PRINCIPAL ELEMENTS

Slide 2: Introduction

**Slides 3-6: Construction Quality Management Cross
Functional Process Flow Chart (4 slides)**

Slide 7: Contract Quality Plan (CQP)

Slide 8: Contract Inspection & Test Plans (ITPs)

**Slide 9: Non-conformance Report / Corrective Action
Request Process**

**Slide 10: Completion Inspection / Punch Listing;
Punch Lists;
Completion Inspection / Punch List Monitoring**

**Slide 11: Completion Inspection / Punch List Categories;
Partial / Precedential / Sub-system Punch Lists**

Slide 12: System Punch Lists

Slide 13: Final Inspection and Handover to Operations

Slide 14: QC Documentation

Slide 15: Contract Inspection & Test Plan (ITP) Form

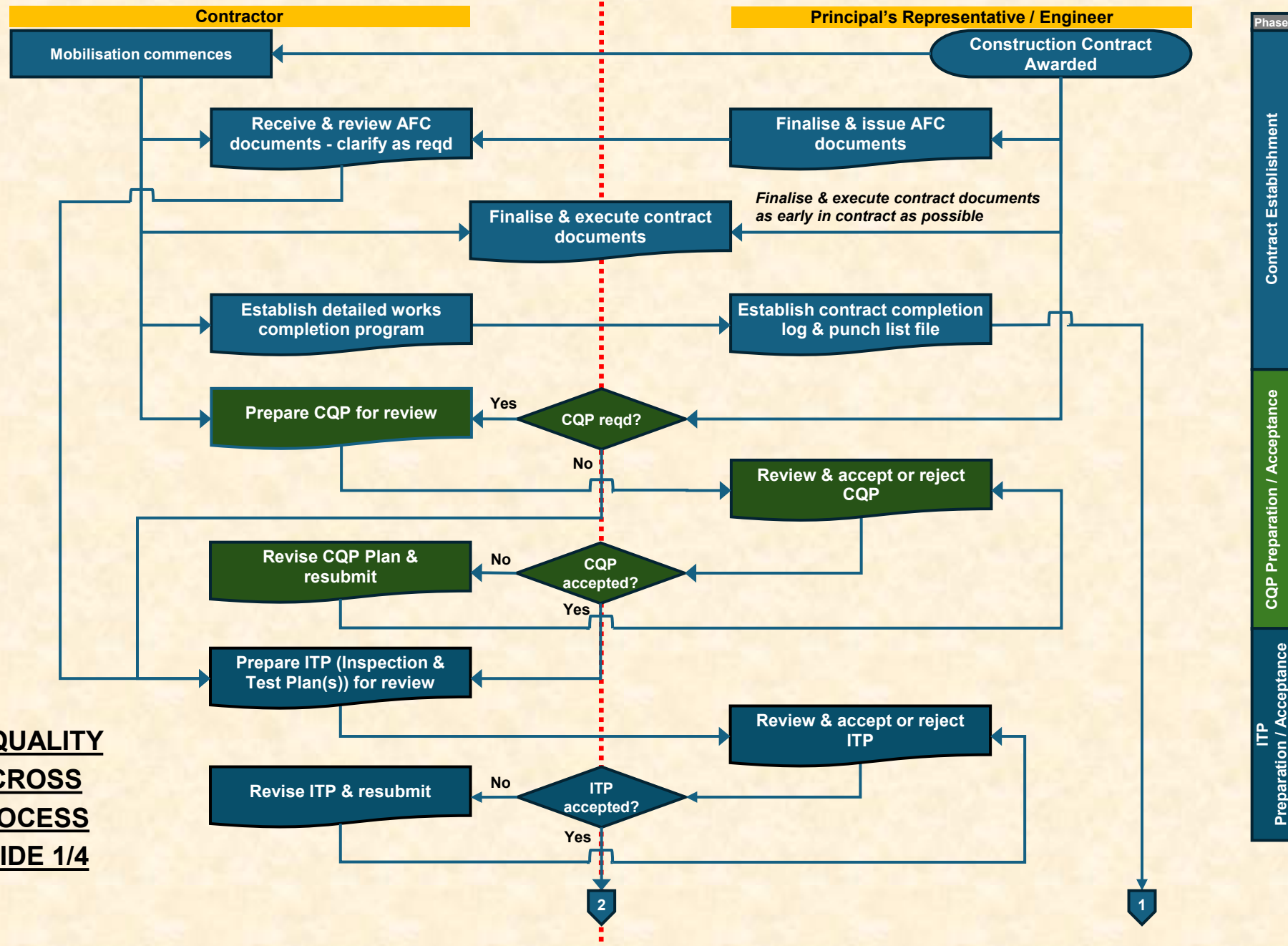
Slide 16: ITP Form - Column Description and Use

**Slide 17: Construction Non-conformance Report /
Corrective Action Request Form**

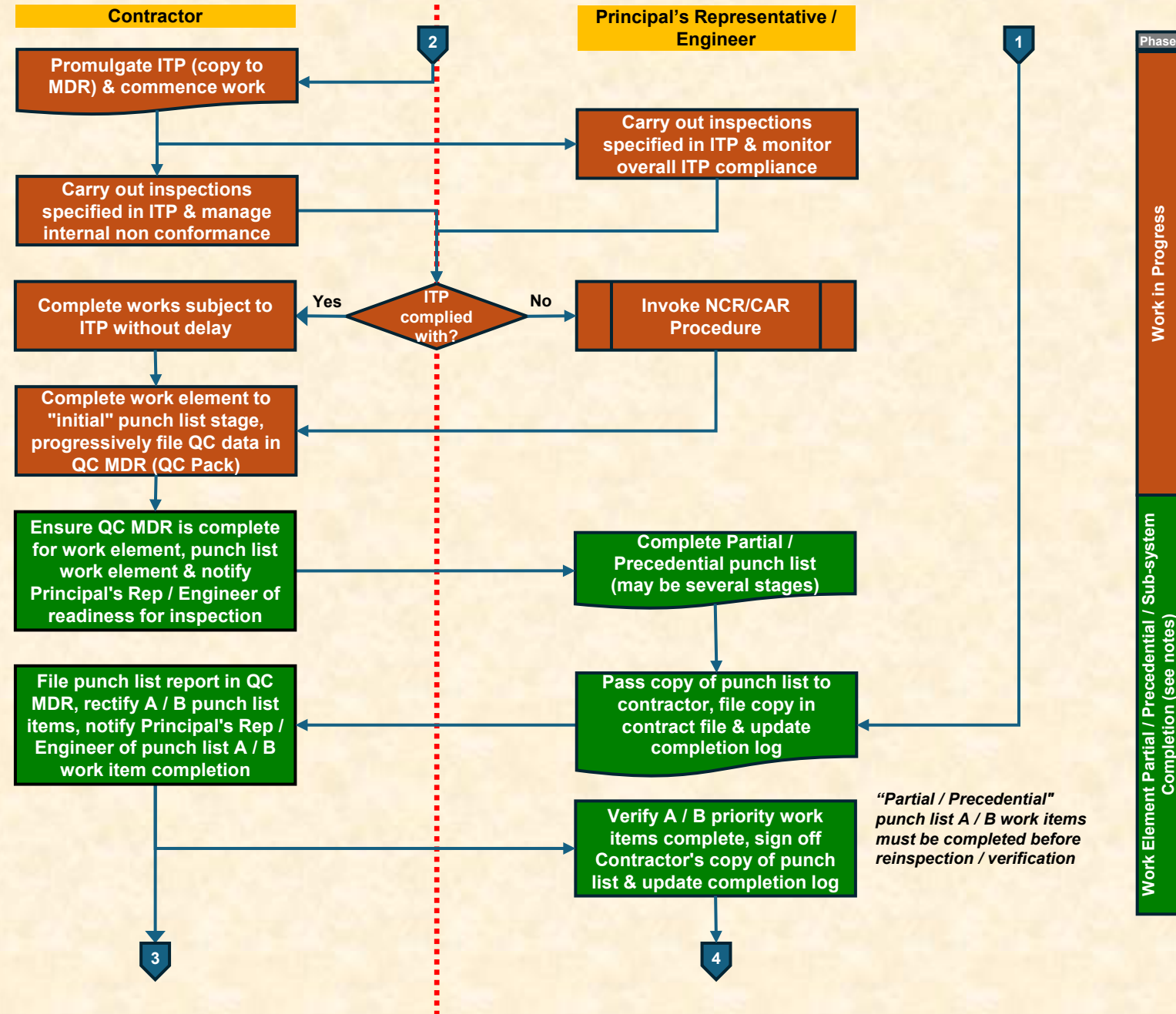
Slide 18: Punch List Form

Introduction

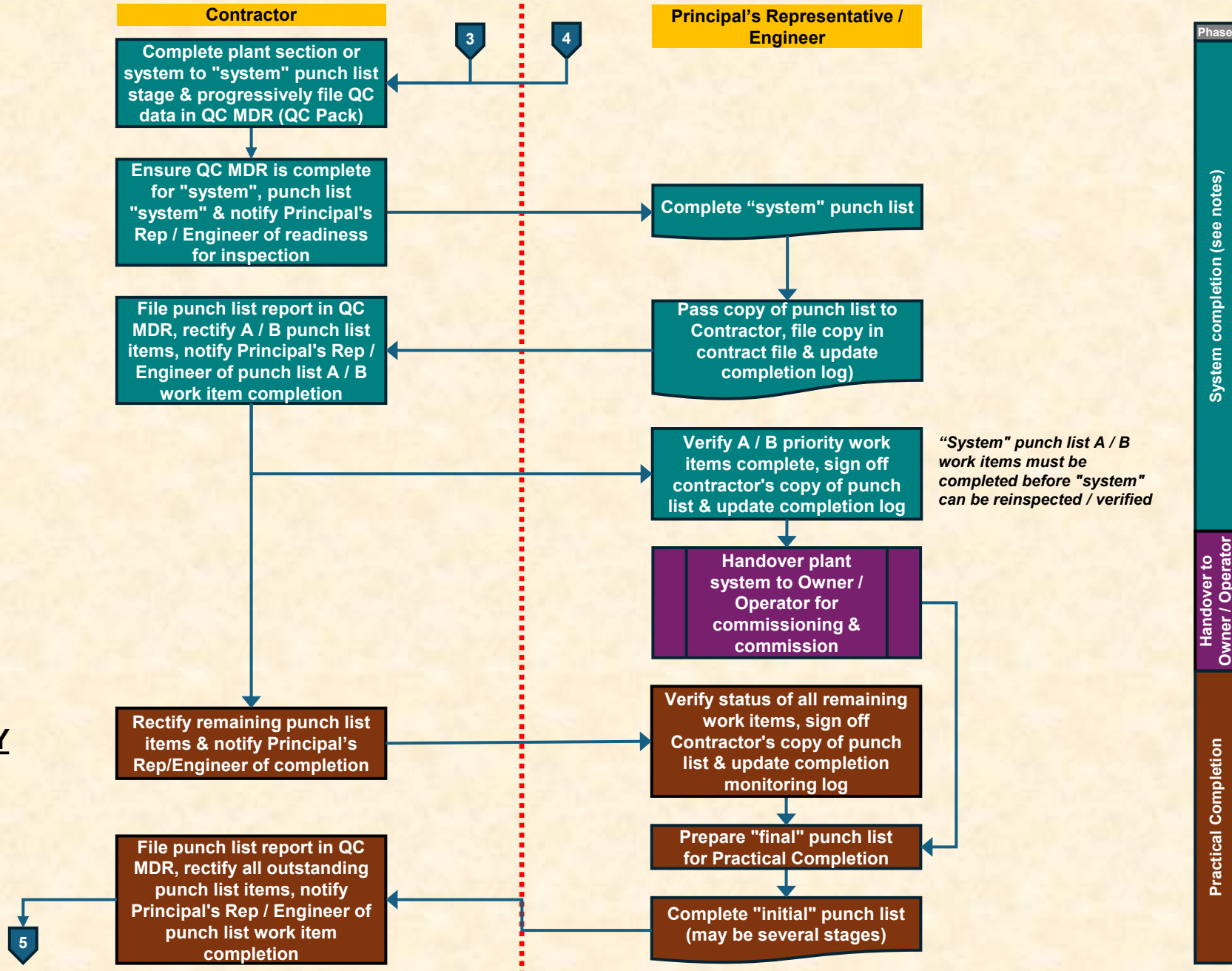
- ❑ Presentation outlines the principal elements of construction contract quality management in process plants (from Principals' perspective).
- ❑ Slides 2 to 5 comprise a continuous, cross functional flow chart covering all phases of the construction quality management process, namely;
 - Contract establishment
 - Contract Quality Plan (CQP) preparation and acceptance
 - Inspection and Test Plan (ITP) preparation and acceptance
 - Work in progress
 - Partial / Precedential / Sub-system completion
 - System completion
 - Handover
 - Practical completion
 - Contract completion
- ❑ Slide 6 outlines construction Contract Quality Plans (CQPs) and their use
- ❑ Slide 7 outlines construction Inspection and Test Plans (ITPs) and their use
- ❑ Slide 8 outlines Non-conformance Report / Corrective Action Request Process (NCR/CAR Process) and its use
- ❑ Slide 9 outlines 'Completion Inspection / Punch Listing', 'Punch Lists' and 'Completion Inspection / Punch List Monitoring'
- ❑ Slide 10 outlines 'Completion Inspection / Punch List Categories' and 'Partial / Precedential / Sub-system Punch Lists'
- ❑ Slide 11 discusses 'System Punch Lists'
- ❑ Slide 12 outlines 'Final Inspection and Handover to Operations'
- ❑ Slide 13 outlines 'QC Documentation' requirements for construction in process plants
- ❑ Slide 14 & 15 show a sample 'ITP' form and supplementary, explanatory notes
- ❑ Slide 16 shows a sample multifunction 'NCR/CAR' form
- ❑ Slide 17 shows a sample 'Punch List' form



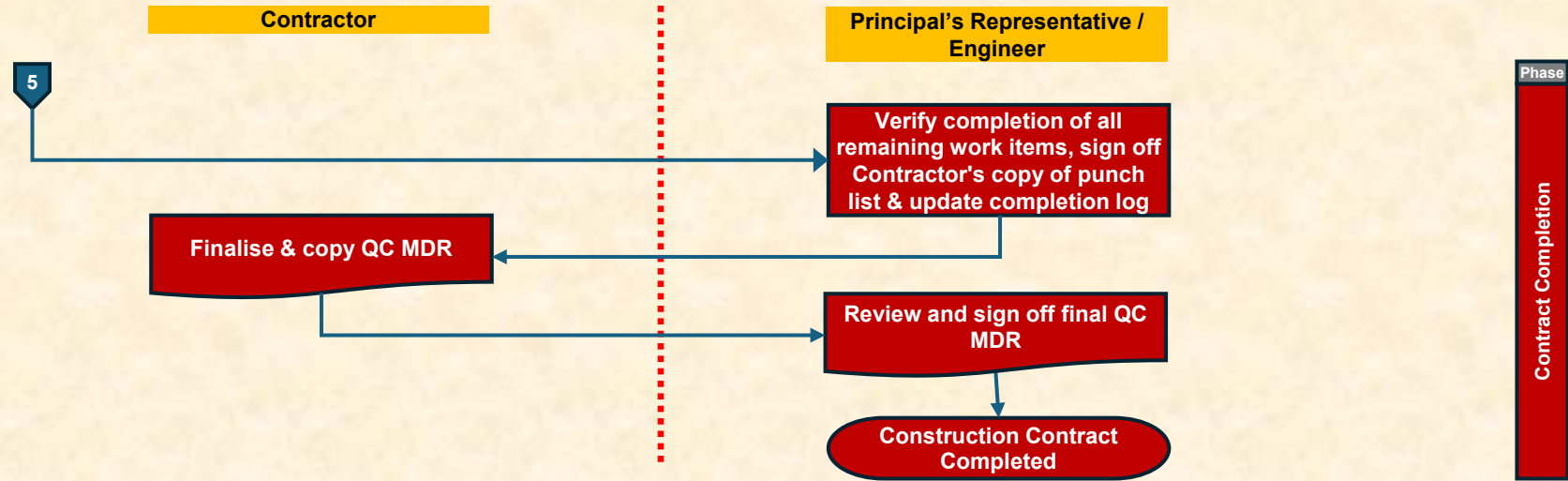
CONSTRUCTION QUALITY
MANAGEMENT CROSS
FUNCTIONAL PROCESS
FLOW CHART SLIDE 1/4



**CONSTRUCTION QUALITY
MANAGEMENT CROSS
FUNCTIONAL PROCESS
FLOW CHART SLIDE 2/4**



CONSTRUCTION QUALITY
MANAGEMENT CROSS
FUNCTIONAL PROCESS
FLOW CHART SLIDE 3/4



Contract Quality Plan (CQP)

- ❑ CQPs are prepared by contractors and are contract specific.
- ❑ CQPs supplement contractors' quality manuals and procedures.
- ❑ CQPs are statements of contractors' intent and commitment regarding quality policies, practices, procedures, organisation and responsibilities etc. for respective contracts.
- ❑ Formal CQPs should be called for in tender documents when contract scope is sufficiently extensive to require a CQP and / or when contractors' quality manuals don't cover respective contract requirements adequately.
- ❑ CQP contents and scope are somewhat subjective, and format and contents can't be specified definitively. However, CQPs will generally include the following quality related aspects;
 - Corporate quality policy
 - Contract quality policy
 - Contractor's contract organisation, functions and responsibilities
 - A list of all QA / QC procedures relevant to the contract, including company procedures and contract specific procedures, specifications and instructions etc.
 - A list of sub-contracted work and services and the quality management systems to be applied by sub- contractors
 - An appropriate outline of how the Contractor proposes to manage quality and compliance with specification, health, safety and environmental aspects etc. to meet the Principal's expectations during the contract.
 - CQP audit programme
- ❑ If a contract requires submission of a CQP, contract works should not commence without an appropriate level of acceptance of the CQP by the Principal's Representative / Engineer.

Contract Inspection & Test Plans (ITPs)

- ❑ ITPs are highly interactive documents, which identify inspection, testing and acceptance requirements for each key construction or maintenance activity in the same sequence as the construction or maintenance process.
- ❑ ITPs (and their review) ensures contractors have defined and planned the most appropriate series of tests and inspections in a timely manner to achieve design intent and to show where the Principal's personnel will undertake inspection and verification.
- ❑ ITP requirements and submission schedule should be clearly defined in contract documents. Submission schedules should enable contractors to submit ITPs in sufficient time for review / acceptance by the Principal's Representative / Engineer and dissemination of accepted ITPs by the Contractor prior to construction or fabrication work commencing. Any special ITP requirements should be included in the tender documents.
- ❑ ITPs should be formatted as required by the contract. A typical ITP pro forma with provision for review and acceptance is shown in slide 14 with supplementary explanatory notes in slide 15. Alternative formats which suit a contractor's quality system should be considered and these should be reviewed and accepted by the Principal at the tender stage. Where an alternative ITP format without review and acceptance provision is accepted by Principal, a special stamp should be used to indicate acceptance level.
- ❑ ITPs are reviewed by the Principal's Representative / Engineer to verify ITP accuracy and completeness and to ensure that all inspections / verifications have been identified and classified correctly. Depending on complexity of construction or maintenance the Principal's Representative / Engineer should co-opt assistance from more competent personnel as and when required. Unsatisfactory ITPs are returned to the Contractor for revision and resubmission. The panel at the foot of the sample ITP pro forma is used to indicate the level of the Principal's acceptance of the ITP.
- ❑ A carefully prepared ITP, including all appropriate process steps, together with appropriate and mutually agreed quality activities for each process step, is a key mechanism in delivering required quality levels and compliance with specification. However, these outcomes will only be achieved if the final ITP is implemented properly and followed closely by both Contractor's and Principal's personnel. The Principal's Representative / Engineer must also determine the necessity for and frequency of audits of the Contractor's quality management systems by the Principal. Such audits are additional to the normal day to day surveillance carried out by the Principal's Representative / Engineer.

Non-conformance Report / Corrective Action Request Process (NCR/CAR) - Principal's Perspective

- ❑ Non-conformances may be discovered during Principal's normal surveillance and during internal or external audits or inspections.
- ❑ The Principal's formal NCR/CAR process provides a means of formally;
 - reporting non-conformances to the Contractor
 - recording the Contractor's view of such non-conformances and possible corrective actions
 - recording the Principal's disposition and approval of corrective actions
 - recording the Principal's acceptance of completed corrective actions
- ❑ The NCR/CAR process is often based on use of a multifunction form that enables Principal and Contractor to formally notify non-conformances, exchange views and opinions about these, determine and request appropriate corrective actions and record implementation of such actions. A sample NCR/CAR multifunction form is shown in slide 16.
- ❑ Contractors generally maintain their own NCR/CAR process for internal use as part of their QMS.
- ❑ Principals and Contractors should each maintain a non-conformance register to record details of all non-conformances for each contract.
- ❑ Principals and Contractors should each file NCR/CARs for each contract according to NCR/CAR completion status.
- ❑ Discretion is required in use of NCR/CARs as many simple or routine non-conformances may be resolved with basic site instructions.

Completion Inspection / Punch Listing

- ❑ Completion inspection / punch listing is carried out for both quality and contractual purposes.
- ❑ Careful, timely punch listing is essential in moving from the advanced stages of field construction to practical completion in a controlled manner with minimum delay.
- ❑ Punch listing therefore includes verification of both work completion and satisfactory completion of all 'receiving' and 'in-process' inspection, testing and verification required by the CQP, ITPs and any other documented procedures.

Punch Lists

- ❑ Punch lists should be prepared using agreed punch list forms and identified with a unique sequential number relating to contract, system, area work pack or P&ID as appropriate by the Principal's Representative / Engineer. A sample punch list form is shown in slide 17.
- ❑ Punch lists must be legible, contain sufficient location detail to enable others to find work items and defect or outstanding work descriptions must be clearly understandable by all concerned.
- ❑ Priorities (defined on the sample punch list form) and required completion dates must be specified for all punch list items.
- ❑ Punch list originals are sent to the Contractor under transmittal for inclusion in the final QC MDR where they can be progressively signed-off by the Contractor and the Principal's Representative / Engineer as punch list work items are completed. The Principal's Representative / Engineer will retain copies of original punch lists.

Completion Inspection / Punch List Monitoring

- ❑ The full completion inspection / punch-listing program should be defined when contract works commence and subsequently monitored to ensure that nothing is overlooked, and facilitation of the completion process is optimised.
- ❑ Once QC test packs have been defined and P&IDs marked up, the Principal's Representative / Engineer should compile a **completion log** by setting up a log sheet for each major system and contractor. All test packs and punch lists the Contractor is responsible for are listed in the completion log. As the key steps in the completion inspection / punch listing process are completed, completion dates are noted in the completion log so there is always a clear, up to date record of completion status.

Completion Inspection / Punch List Categories

There are three broad categories of completion inspection / punch list

- ☐ Partial / precedential / sub-system / discipline
- ☐ System
- ☐ Final inspection for practical completion or handover to operations

Partial / Precedential / Sub-system Punch Lists

(I.e., plant area, section, sub-system, discipline, equipment item etc.)

- ☐ Partial / precedential / sub-system punch lists are single discipline punch lists for discrete, 'bite sized' sections, subsections or single components of larger more complex systems. E.g., piping test packs form discrete sections of a complete plant process system; steel structures support process vessels and piping etc.
- ☐ Punch lists should be divided into the following groups; civil, structural steel, piping, vessels, rotating equipment, electrical, instrumentation, surface protection, insulation etc.
- ☐ Partial / precedential / sub-system punch lists should focus on **outstanding work required to enable progression to the next major construction step, system completion or practical completion**. E.g., pre-hydro punch list prior to hydrotesting in the case of piping. Initial/ sub-system punch listing should be undertaken as early as practicable to facilitate earliest practicable completion. Partial / precedential / sub-system punch lists should include the following.
 - Work requiring correction
 - Work requiring completion
 - Work not started

Listing outstanding work items minimises the need to cover old ground during later checks.

System Punch Lists

(I.e. For a complete plant or system)

- ❑ When a plant or system is substantially complete, the complete entity should be punch listed to ensure that all system components have been installed in accordance with P&IDs, instrument diagrams, single line diagrams, loop diagrams and other specifications.
- ❑ System punch lists should focus on **safe and complete operability**, which requires adequate working knowledge of system components and familiarity with both process and general operating requirements. System punch listing should be undertaken as late as practicable to take full advantage of partial / precedential / sub-system punch listing.
- ❑ System punch lists should include (but not be limited to) the following aspects.
 - Equipment and associated services completed, tested and test blinds removed
 - Piping and valves tight, clean and installed to P&ID
 - Instruments connected, tested and calibrated
 - Electrical equipment tested and operable
 - Personnel safety requirements completed
 - Accessibility requirements completed
 - Plant area tidy with scaffolding and other construction facilities removed
 - Statutory requirements (codes, permits, regulations etc) complete / compliant

Final Inspection and Handover to Operations

- ❑ When a system or contract is practically complete (except for minor punch list items from partial / precedential / sub-system or system punch lists), a final inspection will be carried out by the Principal's Representative / Engineer and Contractor jointly. The resulting final punch list will include all outstanding items agreed by the parties to be completed by the Contractor as part of the Certificate of Practical Completion.
- ❑ Final punch lists are a consolidation of all outstanding items from earlier partial / precedential / sub-system and system punch lists as well as any new items that fall within the contractual scope of work. Final punch list inspections should be scheduled to enable all relevant parties to be present.
- ❑ When all construction or construction testing work has been completed (i.e., all A / B / C punch list items have been completed) and the plant system is ready for hand-over for commissioning, the Principal's Representative / Engineer will submit a construction completion report to the operations manager responsible for commissioning.

QC Documentation

- ❑ The systematic grouping of equipment for erection / testing purposes (i.e. sorting into test packs) and the format in which QA / QC records are required to be assembled, maintained, accessed and handed over, should be discussed at contract kick-off and finalised as expeditiously as possible. The preparation of comprehensive construction work packs during the detail design phase may facilitate this requirement to some extent. The Contractor should mark up a set of P&IDs showing boundaries of each process section, system or sub-system.
- ❑ The actual contents of contractors' final QC MDR (*Manufacturers Data Report*) packages (QC packs) will vary according to contract discipline, scope and complexity. Generally, contract requirements and relevant in-house procedures should be followed. However, as a guide, QC MDRs should be properly indexed and might typically include (but not be limited to) the following if relevant to contract scope:
 - MDR(s) certificate(s) endorsed by Inspection Body covering design, fabrication, erection examination and testing of pressure equipment as appropriate
 - Design verification certificates for pressure equipment and associated, verified design documents endorsed by the Design Verifier.
 - Design certificates and / or producer statements for **design and construction** of civil, structural and mechanical support infrastructure for pressure equipment
 - Accepted CQP and ITP(s)
 - Test pack schedule with marked-up P&IDs showing test boundaries
 - Approved fabrication / erection / welding / testing procedures and procedure qualifications including verification and test reports e.g., WPS, PQR etc.
 - Personnel qualification records e.g. welder qualification register and WPQs etc.
 - Marked up AFC isometrics for piping fabrication / erection (*mark-ups should include weld numbers, material traceability data and materials test certificate #s*). Piping isometrics should also show hazard levels according to AS 4343.
 - Fabrication / construction QC verifications, inspection and test records (ITR) and reports including; surveyors reports, concrete certificates, welding control records, equipment installation reports etc.
 - PWHT reports and charts
 - Non-destructive examination reports e.g. RT, UT, MT, PT, etc.
 - Hydro-test / pneumatic test records including; P&IDs showing test boundaries. test procedures, calibration certificates for pressure gauges and chart recorders, hydro-test certificates and recorder charts endorsed by Inspection Body etc.
 - Surface coating inspection records
 - Test equipment certification and calibration records including; hydro test recorders, pressure gauges and instrument & electrical calibration equipment etc.
 - Materials test certificates and traceability data
 - Instrument / loop calibration reports
 - Hazardous Area Dossier
 - Electrical Test Reports
 - Electrical Certificates of Compliance
 - Installation completion checklists.
 - Punch Lists properly executed by each party - e.g. piping pre-hydro, post-hydro (pre-insulation), post insulation, system and final (i.e. for practical completion).
 - ITPs i.e., finals properly executed by each party
 - NCR(s) properly executed by each party
 - Relevant RFI(s), SI(s) and VO(s)

CONTRACT INSPECTION & TEST PLAN (ITP) FORM

| INSPECTION & TEST PLAN (ITP) | | | | | | | | | | | |
|---|--|--------------------------|--|----------------------------|--------------------------|--|-----------------------------|---------------------------|----------------------------|------------------------|----------|
| Inspection & Test Point Legend H = Hold Point W = Witness Point R = Document Review S = Surveillance | | | Contractor: | | | | ITP Type / Scope: | | | | |
| | | | Contract No / Descr: | | | | ITP No: | | | | |
| | | | Subcontractor: | | | | Revision No: | | | | |
| | | | Subcontract No / Descr: | | | | Date: | | | | |
| Act No. | Manufacturing or Construction Activity Description | By | Inspection & Test Activity Description | Activity Control Procedure | Acceptance Criteria | Verifying Document | Contractor Inspection Point | Contractor's Rep Initials | Principal Inspection Point | Principal Rep Initials | Comments |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
| | | | | | | | | | | | |
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| | | | | | | | | | | | |
| Acceptance of this document does not relieve the Contractor of responsibility for compliance with Contract terms and conditions. Select appropriate acceptance box below. | | | | | | Principal's Acceptance By: | | | | Date: | |
| ACCEPTED, Work may proceed | | <input type="checkbox"/> | ACCEPTED AS NOTED, REVISE & RESUBMIT, Work may proceed | | <input type="checkbox"/> | NOT ACCEPTED, REVISE & RESUBMIT, Work may <u>'not'</u> proceed | | <input type="checkbox"/> | | | |

ITP FORM - COLUMN DESCRIPTION AND USE

| Col # | Column Heading | Column Contents Description | Who |
|-------|--|---|----------------------------|
| 1 | Activity Number | The manufacturing, construction or maintenance activity number in logical process sequence. (Includes procurement, fabrication, transport, receipt on site, construction, commissioning etc.) | SP or Contractor |
| 2 | Manufacturing or Construction Activity Description | Describe the construction, manufacturing or maintenance activity | SP or Contractor |
| 3 | By | Identify who performs the work described in column 2. | SP or Contractor |
| 4 | Inspection & Test Activity Description i.e. Inspection & Test Point | Describe the quality activities or quality characteristics to be verified associated with the work activity in column 2 | SP or Contractor |
| 5 | Activity Control Procedure | Identify quality system procedure or instruction reference for conduct of QC activity defined in column 4 | SP or Contractor |
| 6 | Acceptance Criteria | Identify design specification(s) or code(s) and respective section(s) and clause(s). Also include any critical parameters. | SP or Contractor |
| 7 | Verifying Document | Identify the document(s) used to verify acceptance of QC activity performance | SP or Contractor |
| 8 | Contractor Inspection Point | Define inspection type i.e. W = Witness, H = Hold, R = Review, S = Surveillance. | SP or Contractor |
| 9 | Contractor Initials | Leave blank for later verification. | SP or Contractor |
| 10 | Principal's Inspection Point | Define inspection type i.e. W = Witness, H = Hold, R = Review, S = Surveillance. | Principal's Representative |
| 11 | Principal's Representative's Initials | Leave blank for later verification. | Principal's Representative |
| 12 | Comments | Additional qualifying data as required. | Both as appropriate |

Additional Clarification
➤ Inspection and Test Point

A point or stage in the fabrication and construction cycle where an inspection or test activity is performed. All inspection and test points in the process should be recorded in the ITP.

➤ Principal's Witness Point

An inspection and test point on the ITP designated by the Principal as an activity to be observed by the Principal's Representative. If a Principal's Representative is not present at the pre-arranged time and assuming due notice was given, the Service Provider or Contractor may proceed with the activity.

➤ Principal's Hold Point

An inspection and test point on the ITP designated by the Principal as a point beyond which the Contractor will not proceed without authorisation. The activity will normally be witnessed by the Principal's Representative although in some circumstances, the Contractor may be notified in writing that the activity may proceed without the Principal's Representative.

➤ Surveillance (Monitoring)

Continuing evaluation by Principal and Contractor of the status and use of procedures, methods, inspection activities and records analysis to ensure quality requirements will be met.

➤ Review

Examination of documentary evidence related to inspection and test activities to verify that activities have been conducted satisfactorily and that results are acceptable.

CONSTRUCTION NON-CONFORMANCE REPORT / CORRECTIVE ACTION REQUEST FORM

| CONSTRUCTION / MAINTENANCE NON-CONFORMANCE REPORT | | | |
|---|--|----------------|--|
| Contractor: | | | |
| Contract: | | | |
| Contract No: | | NCR No: | |
| Asset Name / Description: | | | |
| Asset No: | | Spec / Dwg No: | |
| A. NON-CONFORMANCE DETAILS (Attach sketch if necessary) | | | |
| | | | |
| | | | |
| | | | |
| Issued By: (Prncpl's Rep) | | Date: | |
| Received By: (Contractor) | | Date: | |
| B. CONTRACTOR'S RESPONSE / DISPOSITION: | | | |
| <input type="checkbox"/> Rework <input type="checkbox"/> Repair <input type="checkbox"/> Replace <input type="checkbox"/> Use As Is | | | |
| | | | |
| | | | |
| | | | |
| Signed: (Contractor) | | Date: | |
| C. PRINCIPAL'S REPRESENTATIVE DISPOSITION / APPROVAL | | | |
| | | | |
| | | | |
| | | | |
| Signed: (Prncpl's Rep) | | Date: | |
| D. PRINCIPAL'S REPRESENTATIVE RE-INSPECTION: | | | |
| <input type="checkbox"/> Accepted <input type="checkbox"/> Rejected | | | |
| | | | |
| | | | |
| | | | |
| Signed: (Prncpl's Rep) | | Date: | |

| Priority Legend | | Contractor: | | | | | | | Contract No: | | |
|--|-----------------|--|------------------------------------|-----------------|-----------------------------|--------------------------------------|-------------------------------------|---------------------------------------|-----------------------------|--------------|--|
| A = Immediate | | Plant/System/ P&ID#: | | | | | | | Punch List Type: | | |
| B = Prior to Practical Completion | | | | | | | | | | | |
| C = Prior to Product Introduction | | Area/Section#/ Description: | | | | | | | Discipline: | | |
| D = After Product Introduction | | | | | | | | | | | |
| Item No | Asset No | Asset Description | Date Raised | Priority | Date to Complete | Contractor's Rep Initials | Principal's Rep Initials | RI / TPI Initials As Req'd | Comments | Audit | |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | |
| | | | | | | | | | | | |
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| | | | | | | | | | | | |
| PL Inspection By: | | | | | | | | | | | |
| This punch list is not to be considered final or complete and may be subject to the results of further inspections and/or tests. | | | Principal's Representative: | | | | Date: | | Punch List ID: | | |
| | | | / / | | | | / / | | | | |

MAINTENANCE / CONSTRUCTION JOB COST ESTIMATOR

Slide 2: Job Details and Cost Summary (Worksheet image)

Slide 3: Job Activities and Resources (Worksheet image)

Slide 4: Job Spares and Materials (Worksheet image)

Slide 5: Job Miscellaneous Costs (Worksheet image)

Slide 6: Associated Dropdown Lists (Worksheet image)

MMAAPS

MAINTENANCE / CONSTRUCTION JOB COST ESTIMATOR

JOB DETAILS & COST SUMMARY

Plant / Site:

Job ID:

Plant Area:

Asset ID:

Asset Description:

Asset Type:

Job Description:

Job Type:

Job Criticality:

Account Code:

Print A4 Portrait

Formula based cells

| Job Cost Summary Table | | | |
|--------------------------|--------------------------|-------------------------|------------|
| Estimated Resources Cost | Estimated Spares & Matls | Estimated Miscellaneous | Total Cost |
| \$ - | \$ - | \$ - | \$ - |

Links to other worksheets in this workb

[2. Job Activities and Resources](#)

[3. Job Spares and Materials](#)

[4. Job Miscellaneous Costs](#)

[5. Associated Drop Down Lists](#)

MMAPS

MAINTENANCE / CONSTRUCTION JOB COST ESTIMATOR
ACTIVITY & RESOURCE COSTS

Plant / Site:
Job #:
Plant Area:
Asset #:
Asset Description:
Asset Type:
Job Description:
Job Type:
Job Criticality:
Account Code:

Date:

Formula based cells
Print as landscape,
grouped columns shared
100% zoom, open F5X
zoom

1. Job Details and Cost Summary

| Activity ID | Activity Description | Activity Duration | Activities & Resources | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------------------|----------------------|-------------------|-----------------------------|--------------------|--------|----------|----------------------------|--------------------|-----------|---------|------------------|----------|-----------------------|-------------|----------------|-------------|-------------|--------------|------------|--------|---------|--------|---------|---------|----------|---------|---------|---------------|---------|---------|---------|---------|
| | | | Resource Quantities & Hours | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | Fitter | Turner / Machinist | Welder | Mechanic | Refrig / Aircon Technician | Sheet Metal Worker | Carpenter | Plumber | Trades Assistant | Labourer | Instrument Technician | Electrician | NDE Technician | Inspector 1 | Inspector 2 | Safety Watch | Scaffolder | Rigger | Painter | Lagger | Crane 1 | Crane 2 | Forklift | Truck 1 | Truck 2 | Water Blaster | Other 1 | Other 2 | Other 3 | Other 4 |
| 1 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 5 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 6 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 9 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 11 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 12 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 13 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 14 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 15 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Hours | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Resource Budget Rates | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Estimated Resource Costs | | | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 |
| Total Est. Resource Cost | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Resource Details | |
|------------------|--|
| Inspector 1: | |
| Inspector 2: | |
| Crane 1: | |
| Crane 2: | |
| Truck 1: | |
| Truck 2: | |
| Other 1: | |
| Other 2: | |
| Other 3: | |
| Other 4: | |

MMAPS

MAINTENANCE / CONSTRUCTION JOB COST ESTIMATOR

SPARES & MATERIALS COSTS

Plant / Site:

Job ID:

Plant Area:

Asset ID:

Asset Description:

Asset Type:

Job Description:

Job Type:

Job Criticality:

Account Code:

Date:

Formula based cells

Cells with drop down list

Print A4 Landscape

1. Job Details and Cost Summary

Use columns as appropriate for maintenance or construction jobs (optimised for maintenance)

[illegible]

MMAAPS

MAINTENANCE / CONSTRUCTION JOB COST ESTIMATOR
MISCELLANEOUS COSTS

Plant / Site:
Job ID:
Plant Area:
Asset ID:
Asset Description:
Asset Type:
Job Description:
Job Type:
Job Criticality:
Account Code:

Date:

Formula based cells
Print A4 Landscape

[1. Job Details and Cost Summary](#)

| Line Item ID | Cost Item Description | Supplier | Activity ID - W/sheet 2 | Unit Rate | Units | Estimated Cost |
|--------------|-----------------------|----------|----------------------------|-----------|--------|-------------------|
| 1 | | | | | | \$ - |
| 2 | | | | | | \$ - |
| 3 | | | | | | \$ - |
| 4 | | | | | | \$ - |
| 5 | | | | | | \$ - |
| 6 | | | | | | \$ - |
| 7 | | | | | | \$ - |
| 8 | | | | | | \$ - |
| 9 | | | | | | \$ - |
| 10 | | | | | | \$ - |
| 11 | | | | | | \$ - |
| 12 | | | | | | \$ - |
| 13 | | | | | | \$ - |
| 14 | | | | | | \$ - |
| 15 | | | | | | \$ - |
| | | | | | Total: | \$ - |

MMAPS

MAINTENANCE / CONSTRUCTION JOB COST ESTIMATOR DROP DOWN LISTS

1. Job Details and Cost Summary

[illegible]

PRINCIPAL EQUIPMENT FAILURE MODES & POSSIBLE MAINTENANCE ACTIONS MATRIX

Slide 2: Principal Equipment Failure Modes and Possible Maintenance Actions Matrix Worksheet

[illegible]

Index Slide 1/2

| Form / Reg ID | Form / Register Name <i>Mainly for construction / maintenance contract management</i> | Functional Area | Document Type | File Ext. |
|------------------|--|--------------------|------------------|-----------|
| 1a | Inspection and Test Plan (ITP) Form | Qty Mgt | Form | .xlsx |
| 1b | Inspection and Test Plan Form Notes | Qty Mgt | FormNotes | .xlsx |
| 2 | Inspection and Test Plan Register | Qty Mgt | Register | .xlsx |
| 3a | Punch List (PL) Form | Qty Mgt | Form | .xlsx |
| 3b | Punch List Form Notes | Qty Mgt | FormNotes | .xlsx |
| 4 | Completion (PL) Register | Qty Mgt | Register | .xlsx |
| 5 | Non-Conformance Report (NCR) Form | Qty Mgt | Form | .xlsx |
| 6 | Non-Conformance Register | Qty Mgt | Register | .xlsx |
| 7 | Site Instruction (SI) Form | Qty Mgt | Form | .xlsx |
| 8 | Site Instruction Register | Qty Mgt | Register | .xlsx |
| 9 | Variation Order (VO) Form | Qty Mgt | Form | .xlsx |
| 10 | Variation Order Register | Qty Mgt | Register | .xlsx |
| 11 | Transmittal Form | Qty Mgt | Form | .xlsx |
| 12 | Transmittal Register | Qty Mgt | Register | .xlsx |
| 13 | Welding Control Sheet with Materials Traceability Form | Qty Mgt | Form | .xlsx |
| 14 | Welders Record Sheet with Materials Traceability Form | Qty Mgt | Form | .xlsx |
| 15 | Welding Control Sheet without Materials Traceability Form | Qty Mgt | Form | .xlsx |
| 16 | Welders Record Sheet without Materials Traceability Form | Qty Mgt | Form | .xlsx |
| 17 | Project Risk Register | Proj Mgt | Register | .xlsm |
| 18 | Job Risk-Hazard Analysis Form | HSE Mgt | Form | .xlsx |

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|-------|--------------------|
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| 1b | 4 |
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| 3a | 6 |
| 3b | 7 |
| 4 | 8 |
| 5 | 9 |
| 6 | 10 |
| 7 | 11 |
| 8 | 12 |
| 9 | 13 |
| 10 | 14 |
| 11 | 15 |
| 12 | 16 |
| 13 | 17 |
| 14 | 18 |
| 15 | 19 |
| 16 | 20 |
| 17 | 21 |
| 18 | 22 |

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| Form / Reg ID | Form / Register Name <i>Mainly for construction / maintenance contract management</i> | Functional Area | Document Type | File Ext. |
|------------------|--|--------------------|------------------|-----------|
| 19 | Toolbox Meeting Record Form | HSE Mgt | Form | .xlsx |
| 20 | Toolbox Meeting Register | HSE Mgt | Register | .xlsx |
| 21 | Contract Health and Safety Performance Statistics Report | HSE Mgt | Report | .xlsx |
| 22 | Contract Contact List Form | HSE Mgt | Form | .xlsx |
| 23 | Site Inspections - All Categories Form | HSE Mgt | Form | .xlsx |
| 24 | Site Inspection Register | HSE Mgt | Register | .xlsx |
| 25 | Site Inspection Corrective Action Request (CAR) Form | HSE Mgt | Form | .xlsx |
| 26 | Site Inspection Corrective Action Request Register | HSE Mgt | Register | .xlsx |
| 27 | Site Hazard Register | HSE Mgt | Register | .xlsx |
| 28 | Hazardous Substance Register | HSE Mgt | Register | .xlsx |
| 29 | Notifiable Works Register | HSE Mgt | Register | .xlsx |
| 30 | Incident-Accident Register | HSE Mgt | Register | .xlsx |
| 31 | Event Investigation Register | HSE Mgt | Register | .xlsx |
| 32 | Site Visitors Register | HSE Mgt | Register | .xlsx |
| 33 | Worker Competency Register | HSE Mgt | Register | .xlsx |
| 34 | Machine Thermal Alignment Form | Equipment | Form | .xlsx |
| 35 | Machine Thermal Alignment Form Example | Equipment | Form | .xlsx |

| Links | |
|-------|------------------------------------|
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| 34 | |
| 35 | 42, 43, 44 |

| INSPECTION & TEST PLAN (ITP) | | | | | | | | | | | |
|---|--|--------------------------|--|----------------------------|--------------------------|---|-----------------------------|---------------------------|----------------------------|------------------------|----------|
| Inspection & Test Point Legend H = Hold Point W = Witness Point R = Document Review S = Surveillance | | | Contractor: | | | | ITP Type / Scope: | | | | |
| | | | Contract No / Descr: | | | | ITP No: | | | | |
| | | | Subcontractor: | | | | Revision No: | | | | |
| | | | Subcontract No / Descr: | | | | Date: | | | | |
| Act No. | Manufacturing or Construction Activity Description | By | Inspection & Test Activity Description | Activity Control Procedure | Acceptance Criteria | Verifying Document | Contractor Inspection Point | Contractor's Rep Initials | Principal Inspection Point | Principal Rep Initials | Comments |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
| | | | | | | | | | | | |
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| | | | | | | | | | | | |
| Acceptance of this document does not relieve the Contractor of responsibility for compliance with Contract terms and conditions. Select appropriate acceptance box below. | | | | | | Principal's Acceptance By: | | | | Date: | |
| ACCEPTED, Work may proceed | | <input type="checkbox"/> | ACCEPTED AS NOTED, REVISE & RESUBMIT, Work may proceed | | <input type="checkbox"/> | NOT ACCEPTED, REVISE & RESUBMIT, Work may 'not' proceed | | <input type="checkbox"/> | | | |

Inspection & Test Plan (ITP) Form Notes

Slide 1

| Col # | Column Heading | Column Contents Description | Who |
|---------------------------------|---|---|----------------------------|
| 1 | Activity Number | The manufacturing, construction or maintenance activity number in logical process sequence. (Includes procurement, fabrication, transport, receipt on site, construction, commissioning etc.) | SP or Contractor |
| 2 | Manufacturing or Construction Activity Description | Describe the construction, manufacturing or maintenance activity | SP or Contractor |
| 3 | By | Identify who performs the work described in column 2. | SP or Contractor |
| 4 | Inspection & Test Activity Description i.e. Inspection & Test Point | Describe the quality activities or quality characteristics to be verified associated with the work activity in column 2 | SP or Contractor |
| 5 | Activity Control Procedure | Identify quality system procedure or instruction reference for conduct of QC activity defined in column 4 | SP or Contractor |
| 6 | Acceptance Criteria | Identify design specification(s) or code(s) and respective section(s) and clause(s). Also include any critical parameters. | SP or Contractor |
| 7 | Verifying Document | Identify the document(s) used to verify acceptance of QC activity performance | SP or Contractor |
| 8 | Contractor Inspection Point | Define inspection type i.e. W = Witness, H = Hold, R = Review, S = Surveillance. | SP or Contractor |
| 9 | Contractor Initials | Leave blank for later verification. | SP or Contractor |
| 10 | Principal's Inspection Point | Define inspection type i.e. W = Witness, H = Hold, R = Review, S = Surveillance. | Principal's Representative |
| 11 | Principal's Representative's Initials | Leave blank for later verification. | Principal's Representative |
| Additional Clarification | | Additional qualifying data as required. | Both as appropriate |

➤ **Inspection and Test Point**

A point or stage in the fabrication and construction cycle where an inspection or test activity is performed. All inspection and test points in the process should be recorded in the ITP.

➤ **Principal's Witness Point**

An inspection and test point on the ITP designated by the Principal as an activity to be observed by the Principal's Representative. If a Principal's Representative is not present at the pre-arranged time and assuming due notice was given, the Service Provider or Contractor may proceed with the activity.

➤ **Principal's Hold Point**

An inspection and test point on the ITP designated by the Principal as a point beyond which the Contractor will not proceed without authorisation. The activity will normally be witnessed by the Principal's Representative although in some circumstances, the Contractor may be notified in writing that the activity may proceed without the Principal's Representative.

➤ **Surveillance (Monitoring)**

Continuing evaluation by Principal and Contractor of the status and use of procedures, methods, inspection activities and records analysis to ensure quality requirements will be met.

➤ **Review**

Examination of documentary evidence related to inspection and test activities to verify that activities have been conducted satisfactorily and that results are acceptable.

ITP REGISTER

[illegible]

Slide 1

PUNCH LIST (PL)

Slide 1

[illegible]

| <u>PUNCH LIST NOTES</u> | |
|--|--|
| Careful, timely punch listing or completion reporting is essential in moving from the advanced stages of field construction to practical completion in a controlled manner with minimum delay. Punch listing includes verification of work completion and satisfactory completion of all 'receiving' and 'in-process' inspection, testing and verification required by CQP, ITPs and any other documented procedures. | |
| 1. Preliminary Punch Lists (I.e. plant area, section, sub-system, discipline, asset item etc.) <p>Preliminary punch lists are single discipline punch lists for discrete, 'bite sized' sections, subsections or single components of larger more complex systems. E.g. piping test packs form discrete sections of a complete plant process system, steel structures support process vessels and piping etc.</p> <p>Punch lists should be divided into the following typical disciplinary groups, civil, building, structural steel, piping, vessels, rotating equipment, electrical, instrumentation, surface protection, insulation etc.</p> <p>Initial punch lists should focus on the outstanding work required to either enable progression to the next major construction step (e.g. pre-hydro punch list in the case of piping), system punch listing or practical completion. Preliminary punch listing should be undertaken as early as practicable to facilitate the earliest practicable completion. Preliminary punch lists should include work requiring correction, work requiring completion and work not started</p> | |
| 2. Plant / Plant System Punch Lists <p>When a plant or system is substantially complete, the complete entity should be punch listed to ensure that all system components have been installed in accordance with P&IDs, instrument diagrams, single line diagrams, loop diagrams and other specifications.</p> <p>System punch lists should focus on safe and complete operability, which requires adequate working knowledge of system components and familiarity with both process and general operating requirements. System punch listing should be undertaken as late as practicable to take full advantage of initial punch listing. System punch lists should include (but not be limited to) the following.</p> <ul style="list-style-type: none"> • Equipment and associated services completed, tested and test blinds removed. • Piping and valves tight, clean and installed to P&ID. • Instruments connected, tested and calibrated. • Electrical equipment tested and operable. • Personnel safety requirements completed. • Accessibility requirements completed. • Plant area tidy with scaffolding and other construction facilities removed. • Statutory requirements (codes, permits, regulations etc) complete. | |
| 3. Punch Listing <p>Punch lists should be prepared using the standard punch list form and identified with a unique sequential list number relating to contract, system, area work pack or P&ID as appropriate by the principal's representative. Punch lists must be legible, contain sufficient location detail to enable others to find work items and defect and outstanding work descriptions must be clearly understandable by all concerned. Priorities (defined on the punch list form) and required completion dates must be specified for all punch list items.</p> <p>Punch list originals are sent to the contractor under transmittal for inclusion in the final QC MDR where they can be progressively signed off by the contractor and the principal's representative as punch list work items are completed. The principal's representative will retain copies of <u>original punch lists</u>.</p> | |
| 4. Completion Monitoring / Completion Register <p>Punch listing or completion reporting is carried out for both quality and contractual purposes. The full punch-listing programme should be identified when contract works commence and subsequently monitored to ensure that nothing is overlooked, and that facilitation of the completion process is optimised.</p> <p>Once QC test packs have been defined and P&IDs marked up, the principal's representative will compile a completion register by setting up a completion register for each major system and service provider or contractor. The proposed test packs and punch lists for which a service provider or contractor is responsible are listed in respective completion registers. As the punch listing / completion inspection process is completed, completion dates for respective punch list items are noted on the punch list form so that there's always a clear, up-to-date record of</p> | |

COMPLETION REGISTER

[illegible]

Slide 1

| CONSTRUCTION / MAINTENANCE NON-CONFORMANCE REPORT | | | |
|--|--|----------------|--|
| Contractor: | | | |
| Contract: | | | |
| Contract No: | | NCR No: | |
| Asset Name / Description: | | | |
| Asset No: | | Spec / Dwg No: | |
| A. NON-CONFORMANCE DETAILS (Attach sketch if necessary) | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Issued By: (Prncpl's Rep) | | Date: | |
| Received By: (Contractor) | | Date: | |
| B. CONTRACTOR'S RESPONSE / DISPOSITION: | | | |
| <div> <div>Rework <input type="checkbox"/></div> <div>Repair <input type="checkbox"/></div> <div>Replace <input type="checkbox"/></div> <div>Use As Is <input type="checkbox"/></div> </div> | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Signed: (Contractor) | | Date: | |
| C. PRINCIPAL'S REPRESENTATIVE DISPOSITION / APPROVAL | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Signed: (Prncpl's Rep) | | Date: | |
| D. PRINCIPAL'S REPRESENTATIVE RE-INSPECTION: | | | |
| <div> <div>Accepted <input type="checkbox"/></div> <div>Rejected <input type="checkbox"/></div> </div> | | | |
| | | | |
| | | | |
| | | | |
| Signed: (Prncpl's Rep) | | Date: | |

NON-CONFORMANCE REGISTER

Slide 1

[illegible]

[illegible]

SITE INSTRUCTION REGISTER

[illegible]

| | | | | | | | | | |
|--|--|--------------------------|------------------|--|--------|------|------------------|----|--------------------------|
| VARIATION ORDER (VO) | | | | | | | | | |
| To: (Contractor) | | | | | VO No: | | | | |
| | | | | | Page: | | of | | |
| Contract No: | | | | | Date: | | | | |
| Contract: | | | | | | | | | |
| You are hereby instructed to carry out the following work: (Enter required information and select check boxes below as appropriate.) | | | | | | | | | |
| At your lump sum price of | | | | | | | | \$ | |
| At your schedule of rates specified under the subject contract. | | | | | | | | | <input type="checkbox"/> |
| On a time and material basis. Submit your claim within ten (10) days of completion date. Time sheets for all supervision, labour, material plant and equipment are to be signed daily | | | | | | | | | <input type="checkbox"/> |
| Prices / rates are fixed | | | | | | | | | <input type="checkbox"/> |
| Prices / rates are subject to rise and fall | | | | | | | | | <input type="checkbox"/> |
| Full Work Description | | | | | | | | | |
| Subject: | | | | | | | Ref: | | |
| | | | | | | | | | |
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| | | | | | | | | | |
| (use continuation sheet as appropriate) | | | | | | | | | |
| The Practical Completion date due to this Site Instruction: | | | | | | | | | |
| Remains Unchanged: | | <input type="checkbox"/> | Increases By: | | | days | Decreases By: | | |
| This Site Instruction does not alter the Contract value. | | | | | | | | | |
| All terms, covenants and conditions of the subject Contract remain in full force and effect. | | | | | | | | | |
| Issued By: | | | | | | | Title: | | |
| Approved By: | | | | | | | Title: | | |
| Signed acknowledgement must be returned to the Principal by the Contractor. | | | | | | | | | |
| Receipt of VO acknowledged by Contractor: | | | | | | | | | |
| Signature: | | | | | | | | | |
| Title: | | | | | | | | | |
| Date: | | | | | | | | | |
| Distribution: | | | | | | | | | |
| Original: Contractor | | | | | | | | | |
| Duplicate: Contractor signs and returns to Principal | | | | | | | | | |
| Copies: Contract VO file | | | | | | | | | |

VARIATION ORDER REGISTER

[illegible]

Slide 1

| Document Transmittal Notice | | | | | | | | | | | |
|--|-------------|------|---------------------|-----------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--|
| To: <i>(Company)</i> | | | | | | Transmittal No: | | | | | |
| Attention: | | | | | | Date Compiled: | | | | | |
| Contract: | | | | | | | | | | | |
| Contract ID: | | | | | | | | | | | |
| Item | Document ID | Rev# | Title / Description | No of Docs Sent | Issued For | | | | | | |
| | | | | | Info / Records | Review / Comment | Construction | Action | As-built Records | Tender | |
| 1 | | | | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | |
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| Sender: | | | | | | | | | | | |
| Company: | | | | | | | | | | | |
| Sent By: | | | | | | Date Sent: | | | | | |
| Receiver: | | | | | | | | | | | |
| Company: | | | | | | | | | | | |
| Received By: | | | | | | Date Receiv | | | | | |
| Receiver: Please, promptly return copy to sender acknowledging receipt of documents. | | | | | | | | | | | |

Document Transmittal Register

Slide 1

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Full Materials Traceability - Hazard Levels A & B

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Full Materials Traceability - Hazard Levels A & B

Line ID:

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Slide 1

No Materials Traceability - Hazard Levels C, D & E

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1 Conditional Formatting 25
Columns O,I

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Slide 1

Date:

Job Description:

1 Conditional Formatting 25
Columns G,Y

| Activity ID | Activity Description | Hazard Activity ID | Risk/Hazard | RISK | | | | Control Activity ID | Risk / Hazard Control | RISK | | | | Comments |
|-------------|------------------------|--------------------|----------------------------------|-----------------|---------------|--------------|----------------|---------------------|-----------------------|-----------------|---------------|--------------|----------------|----------|
| | | | | Notifiable Work | Detectability | Highest Risk | Principal Risk | | | Notifiable Work | Detectability | Highest Risk | Principal Risk | |
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| | Work Permits Required: | | Work Permit Extensions Required: | | | | | | | | | | | |
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| TOOLBOX MEETING RECORD | | | | | | |
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| Contract: | | | | | Date: | |
| Site: | | | | | Team: | |
| Present: | | | | | | |
| Spare | Spare | Spare | Spare | Spare | Spare | Spare |
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| Spare | Spare | Spare | Spare | Spare | Spare | Spare |
| Spare | Spare | Spare | Spare | Spare | Spare | Spare |
| Absent: | | | | | | |
| Spare | Spare | Spare | Spare | Spare | Spare | Spare |
| Spare | Spare | Spare | Spare | Spare | Spare | Spare |
| Topics discussed and employee comments: | | | | | | |
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| Handouts: | | | | | | |
| Incidents & accidents OR task analysis review: | | | | | | |
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| Handouts: | | | | | | |
| Corrective actions: | | | | | | |
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| Handouts: | | | | | | |
| Hazards and emergency procedures raised by employees and discussed: | | | | | | |
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| Handouts: | | | | | | |
| Other: | | | | | | |
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| Name: Spare Designation: Signature: | | | | | | |

| TOOLBOX MEETING REGISTER | | | | | | | | |
|--------------------------|--------------|------|----------------|----------|--------------------------|--------------------------|-------------------|---------------------|
| Contract: | | | | | | | | |
| Site: | | | | | | | | |
| Item ID | Meeting Date | Team | Meeting Leader | Location | No Unresolved Issues | Mtg Record Distributed | Unresolved Issues | Date Issue Resolved |
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| 26 | | | | | <input type="checkbox"/> | <input type="checkbox"/> | | |

CONTRACT HEALTH & SAFETY PERIODIC PERFORMANCE EVALUATION

Contract:

Period:

Evaluation Date:

| Period Metrics | Principal Contractor & Subcontractors for Specific Period | | | | | Period Totals |
|--|---|--|--|--|--|---------------|
| | | | | | | |
| No of JHAs / Task Analyses carried out | | | | | | 0 |
| No of safety inductions carried out | | | | | | 0 |
| No of toolbox meetings held | | | | | | 0 |
| No of toolbox meeting minutes completed | | | | | | 0 |
| No of site safety inspections completed | | | | | | 0 |
| No of incidents identified | | | | | | 0 |
| No of incident investigation forms completed | | | | | | 0 |
| No of incident causes identified | | | | | | 0 |
| No of incident corrective actions identified | | | | | | 0 |
| No of incident corrective actions completed | | | | | | 0 |
| Time on project (man-hours) | | | | | | 0 |
| No of medical treatment accidents | | | | | | 0 |
| No of lost time injuries | | | | | | 0 |

| Cumulative Metrics | Contract Cumulative by Period | | | | | | | | | | Cmltv Totals |
|--|-------------------------------|--|--|--|--|--|--|--|--|--|--------------|
| | | | | | | | | | | | |
| No of JHAs/Task Analyses carried out | | | | | | | | | | | 0 |
| No of safety inductions carried out | | | | | | | | | | | 0 |
| No of toolbox meetings held | | | | | | | | | | | 0 |
| No of toolbox meeting minutes completed | | | | | | | | | | | 0 |
| No of site safety inspections completed | | | | | | | | | | | 0 |
| No of incidents identified | | | | | | | | | | | 0 |
| No of incident investigation forms completed | | | | | | | | | | | 0 |
| No of incident causes identified | | | | | | | | | | | 0 |
| No of incident corrective actions identified | | | | | | | | | | | 0 |
| No of incident corrective actions completed | | | | | | | | | | | 0 |
| Time on project (man-hours) | | | | | | | | | | | 0 |
| No of medical treatment accidents | | | | | | | | | | | 0 |
| No of lost time injuries | | | | | | | | | | | 0 |

Slide 2

CONTRACT CONTACT LIST

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Slide 2

| SITE SAFETY INSPECTIONS - All Categories | | | | |
|---|----|---|--------------|-------|
| Contract: | | | | |
| Area: | | | | |
| Inspectors: | | | | Date: |
| Inspection Categories / Issues | | Rating | Observations | |
| <input type="checkbox"/> A Hazards | | | | |
| A | 1 | Are hazards managed adequately? | | |
| A | 2 | Is there adequate site signage / hazard board? | | |
| A | 3 | Is there a visitors log present? | | |
| A | 4 | Are all personnel being inducted correctly? | | |
| A | 5 | Are emergency procedures in place? | | |
| A | 6 | Are emergency evacuation drills held at prescribed frequency? | | |
| A | 7 | Are subcontractors safety plans available? | | |
| A | 8 | Are subcontractors safety meetings held? | | |
| A | 9 | Are toolbox meetings held? | | |
| A | 10 | Are all workers passports being verified? | | |
| A | 11 | Is hazard identification being done and managed effectively? | | |
| A | 12 | Is task analysis being done for significant operations? | | |
| A | 13 | Has all notifiable work been notified in a timely manner? | | |
| A | 14 | Is a permit to work system in place and is it used effectively? | | |
| B Facilities | | | | |
| B | 1 | Are site offices clean and tidy? | | |
| B | 2 | Are ammenity areas clean and tidy? | | |
| B | 3 | Is lunch room and food prep area clean and tidy? | | |
| B | 4 | Are temporary electrical installations tagged? | | |
| B | 5 | Are first aid kits in place and well stocked? | | |
| B | 6 | Is lighting adequate? | | |
| B | 7 | Are fire extinguishers charged and current? | | |

| SITE SAFETY INSPECTIONS - All Categories | | | |
|--|---|--------|--------------|
| Contract: | | | |
| Area: | | | |
| Inspectors: | | Date: | |
| Inspection Categories / Issues | | Rating | Observations |
| C Houskeeping | | | |
| 1 | Are work areas clean and tidy? | | |
| 2 | Are materials stacked safely? | | |
| 3 | Are rubbish bins provided and emptied regularly? | | |
| 4 | Are combustible materials stored safely? | | |
| 5 | Is lighting adequate? | | |
| 6 | Is public protection adequate? | | |
| D Standard Ladders | | | |
| 1 | Are ladders industrial rated and in good condition? | | |
| 2 | Are stiles / rungs / back stays undamaged? | | |
| 3 | Are ladders used correctly & secured top & bottom? | | |
| E Step Ladders | | | |
| 1 | Are ladders industrial rated and in good condition? | | |
| 2 | Are stiles / rungs / back stays undamaged? | | |
| 3 | Do personnel work no higher than third step from top? | | |
| 4 | Are ladders used correctly? | | |
| F Standing Scaffold | | | |
| 1 | Is scaffold erected by certified scaffolders? | | |
| 2 | Is Scaf-tag / Acu-log scaffold register up to date? | | |
| 3 | Is ladder access to scaffold adequate? | | |
| 4 | Are guard rails between 0.9 and 1.1metres? | | |
| 5 | Are intermediate rail / stop ends in place? | | |
| 6 | Is debris netting in place where necessary? | | |
| 7 | Are 225 mm minimum toe-boards in place? | | |
| 8 | Do scaffold platforms have a minimum width of three planks? | | |
| 9 | Are planks secured adequately? | | |
| 10 | Are base plates and sole plates adequate? | | |
| 11 | Is scaffold bracing adequate? | | |

Slide 2/5

Slide 2

| SITE SAFETY INSPECTIONS - All Categories | | | |
|--|--|--------|--------------|
| Contract: | | | |
| Area: | | | |
| Inspectors: | | Date: | |
| Inspection Categories / Issues | | Rating | Observations |
| G Mobile Scaffold | | | |
| G | 1 Are mobile scaffolds set up on firm ground? | | |
| G | 2 Are wheels locked? | | |
| G | 3 Is diagonal bracing across base adequate? | | |
| G | 4 Are decks fully planked and secure? | | |
| G | 5 Are guard rails between 0.9 and 1.1metres? | | |
| G | 6 Are 225 mm minimum toe-boards in place? | | |
| G | 7 Is access safe and appropriate? | | |
| G | 8 Are outriggers in place when scaffold height is >3 times base width? | | |
| G | 9 Is scafflod bracing adequate? | | |
| G | 10 Are scaffolds only moved without personnel aboard? | | |
| H Elevated Work Platforms (EWPs) | | | |
| H | 1 Are EWPs set up on level ground with outriggers fully extended? | | |
| H | 2 Are EWPs inspected / tested within last 6 months [visible certificate]? | | |
| H | 3 Are EWPs operated at least 4 metres from power lines? | | |
| H | 4 Is fall prevention harness worn? | | |
| H | 5 Is lanyard fixing adequate? | | |
| H | 6 Are EWP operators trained and competent to use EWP unsupervised? | | |
| I Electrical | | | |
| I | 1 Is portable electrical equipment tested, certified and tagged three-monthly? | | |
| I | 2 Are leads clear of water and out of harm's way? | | |
| I | 3 Are ELCB / transformers used consistently? | | |
| I | 4 Double adaptors and multi-boxes shouldn't be used. | | |
| I | 5 Is temporary lighting adequate and in good condition? | | |

Slide 3/5

Slide 2

| <u>SITE SAFETY INSPECTIONS - All Categories</u> | | | | |
|--|---|--|---------------------|--|
| Contract: | | | | |
| Area: | | | | |
| Inspectors: | | | Date: | |
| Inspection Categories / Issues | | Rating | Observations | |
| J Personal Protective Equipment (PPE) | | | | |
| J | 1 | Are hard hats worn as required? | | |
| J | 2 | Are safety glasses / goggles worn when required? | | |
| J | 3 | Are respirators / masks worn when required? | | |
| J | 4 | Is hearing protection worn when required? | | |
| J | 5 | Is protective clothing worn when required? E.g. gloves, overalls, etc. | | |
| J | 6 | Are high visibility vests or clothing worn when required? | | |
| J | 7 | Is adequate safety footwear worn? | | |
| J | 8 | Are fall prevention harnesses available and used when required? | | |
| J | 9 | Are sunhats, sunscreen lotion and shade used when required? | | |
| K Cranes | | | | |
| K | 1 | Do cranes have current certificates of inspection? | | |
| K | 2 | Are crane drivers qualified? | | |
| K | 3 | Is lifting gear tested and certified? | | |
| K | 4 | Are qualified riggers and dog men used to rig and direct lifts? | | |
| K | 5 | Are lifting plans prepared when required? | | |
| K | 7 | Are cranes set up on level ground with outriggers fully extended? | | |
| K | 8 | Are cranes operated with booms at least 4 metres from power lines? | | |

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Slide 2

| SITE SAFETY INSPECTIONS - All Categories | | | |
|--|--|--------|--------------|
| Contract: | | | |
| Area: | | | |
| Inspectors: | | Date: | |
| Inspection Categories / Issues | | Rating | Observations |
| L Specific Hazard Controls (Not Exhaustive) | | | |
| L 1 | Are all machines compliant with current certification? | | |
| L 2 | Are all workers and machine operators trained and competent for their allotted tasks? (Refer Competency Register) | | |
| L 3 | Are all workers outside digger operating zone when digger working? | | |
| L 4 | Are trenches covered when not in use? | | |
| L 5 | Have fall hazards been eliminated and/or appropriate controls implemented? | | |
| L 6 | Are propping systems braced, tied and props okay? | | |
| L 7 | Are safety anchors / static lines for fall prevention adequate? | | |
| L 8 | Are all vertical reinforcing steel bars capped appropriately? | | |
| L 9 | Are crane slings and chains certified? | | |
| L 10 | Are housekeeping, lighting, slips, trips and falls controls adequate? | | |
| L 11 | Are gas bottles secured correctly when in use and when in storage? | | |
| L 12 | Are flash back arrestors fitted to oxy / acetylene sets? | | |
| L 13 | Are powder-powered tools currently certified? | | |
| L 14 | Are powder-powered tool users certificated and wearing appropriate PPE? | | |
| L 15 | Are powder-powered tools locked away when not in use? | | |
| L 16 | Is bump firing of compressed air nailing guns prohibited? | | |
| L 17 | Is Worksafe notified in advance for site excavations over 1.5metres? | | |
| L 18 | Is excavation timbering in place? | | |
| L 19 | Do excavations and confined spaces have safe access and egress? | | |
| L 20 | Are services identified, located and secured adequately? | | |
| L 21 | Are site workers and public adequately protected? | | |
| L 22 | Have emergency procedures been developed, communicated and practiced? | | |
| L 23 | Is fire protection comprising extinguishers, hose reels adequate?and evacuation drill, hot work permits | | |
| L 25 | Are hazardous substances identified and stored correctly? Are MSDS available? | | |
| L 26 | Are permits to work covering specific activities identified through task / hazard analysis, such as confined space, excavations, working over water, working at height, etc. adequate / effective? | | |

Slide 5/5

Slide 2

| SITE INSPECTION REGISTER | | | | | | | |
|--------------------------|-----------------|-----------------|----------|--------------|-----------------------------|-------------------|----------------------|
| Contract: | | | | | | | |
| Item ID | Inspection Date | Inspection Type | Location | Inspector(s) | Issues Requiring Correction | Correction Action | Date Issue Corrected |
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| SITE SAFETY INSPECTION CORRECTIVE ACTION REPORT | | | | |
|---|------------------------|----------|-------------|-------------------|
| Contract: | | | | |
| Contractor: | | | | |
| Area: | | CAR ID: | | |
| Inspection Type: | | File: | | |
| Inspectors: | | Date: | | |
| | Corrective Action Item | Date Due | Review Date | Completion Status |
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| General comments / concerns | | | | |
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| Inspector's signature: | | | Date: | |
| Site Supervisor's signature: | | | Date: | |

| SITE INSPECTION CAR REGISTER | | | | | | | |
|------------------------------|---------------------|-----------------|--------------------------|---------------------|----------------------|-----------------|---------------------------------------|
| Contract: | | | | | | | |
| Site: | | | | | | | |
| Item ID | CAR Initiation Date | Inspection Type | No of Corrective Actions | Site Inspector Name | Site Supervisor Name | Area / Location | Date All Corrective Actions Completed |
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| NOTIFIABLE WORKS REGISTER | | | | | | | |
| OnLine Notification: | | https://www.worksafe.govt.nz/notifications/report-scheduled-or-completed-work/hazardous-work/ | | | | | |
| Contract: | | | | | | | |
| Item ID | Notifiable Works Description | Date Works Expected | Date Worksafe Advised | | Worksafe Reply Date | Date Works Done | Comments |
| | | | Verbally | OnLine | | | |
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| EVENT INVESTIGATION REGISTER | | | | | | | | | | | | |
|------------------------------|---------------|--------------------|----------------------------|-----------------------|-----------------------|-----------------|-------------------------------|----------------------|----------------------|-------------------|------------------------------|----------------------------------|
| Contract: | | | | | | | | | | | | |
| Event ID | Date of Event | Incident Report ID | Date Incident Report Rec'd | Date Invstgtn Started | Investigation Subject | Investigator(s) | Investigation Outcome Summary | Corrective Action(s) | Date Invstgtn Cmpltd | Date CA(s) Cmpltd | Date Hazard Register Revised | Date of Review at Safety Meeting |
| ▼ | ▼ | ▼ | ▼ | ▼ | ▼ | ▼ | ▼ | ▼ | ▼ | ▼ | ▼ | ▼ |
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SITE VISITORS REGISTER

[illegible]

Slide 2

WORKER COMPETENCY / TRAINING REGISTER

Employer:

Competency verification held on file

Slide 2

[illegible]

MACHINERY THERMAL ALIGNMENT ASSESSMENT TEMPLATE FOR VERTICAL PLANE (APPROXIMATION)

Slide 1/3

Slide 2

Company:

Asset:

Date:

| NDE Temp DegC | | | DE Temp DegC | | | SM Matl. | MM Matl. | DE Temp DegC | | | NDE Temp DegC | | |
|---------------|------|-----|--------------|------|-----|-----------|-----------|--------------|------|-----|---------------|------|-----|
| Point | Cold | Hot | Point | Cold | Hot | CI | CI | Point | Cold | Hot | Point | Cold | Hot |
| 1 | | | 1 | | | SM LCoE | MM LCoE | 1 | | | 1 | | |
| 2 | | | 2 | | | 0.0000108 | 0.0000108 | 2 | | | 2 | | |
| 3 | | | 3 | | | | | 3 | | | 3 | | |
| 4 | | | 4 | | | | | 4 | | | 4 | | |
| 5 | 20 | 100 | 5 | 20 | 150 | | | 5 | 20 | 150 | 5 | 20 | 100 |
| Ave | 20 | 100 | Ave | 20 | 150 | | | Ave | 20 | 150 | Ave | 20 | 100 |

| Matl. | LCoE | |
|-------|-----------|-------|
| CI | 0.0000108 | m/m°C |
| Steel | 0.0000120 | m/m°C |
| Al | 0.0000230 | m/m°C |
| 304SS | 0.0000173 | m/m°C |

STATIONARY MACHINE (SM)

DE & NDE Temp Points

Machine Centre Line

SM Shaft Centre Height Distance

MM Shaft Centre Height Distance

0.300 m

0.300 m

0.300 m

0.300 m

0.900 m

MOVABLE MACHINE (MM)

DE & NDE Temp Points

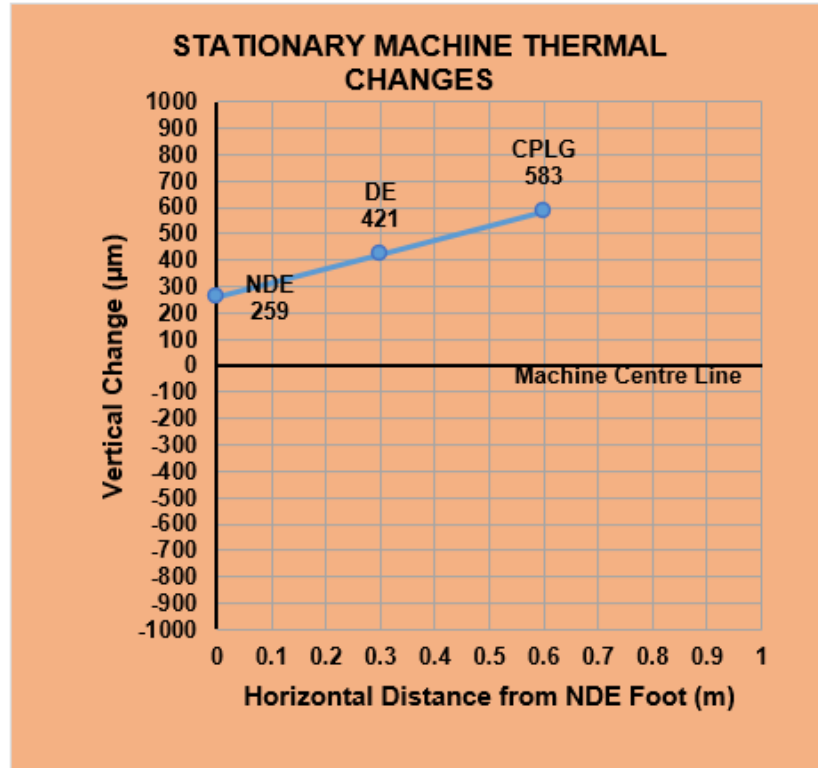
| NDE CH Change | DE CH Change | CPLG CH Change |
|---------------|--------------|----------------|
| 259 µm | 421 µm | 583 µm |

| CPLG Change | DE Change | NDE Change |
|-------------|-----------|------------|
| 583 µm | 421 µm | 259 µm |

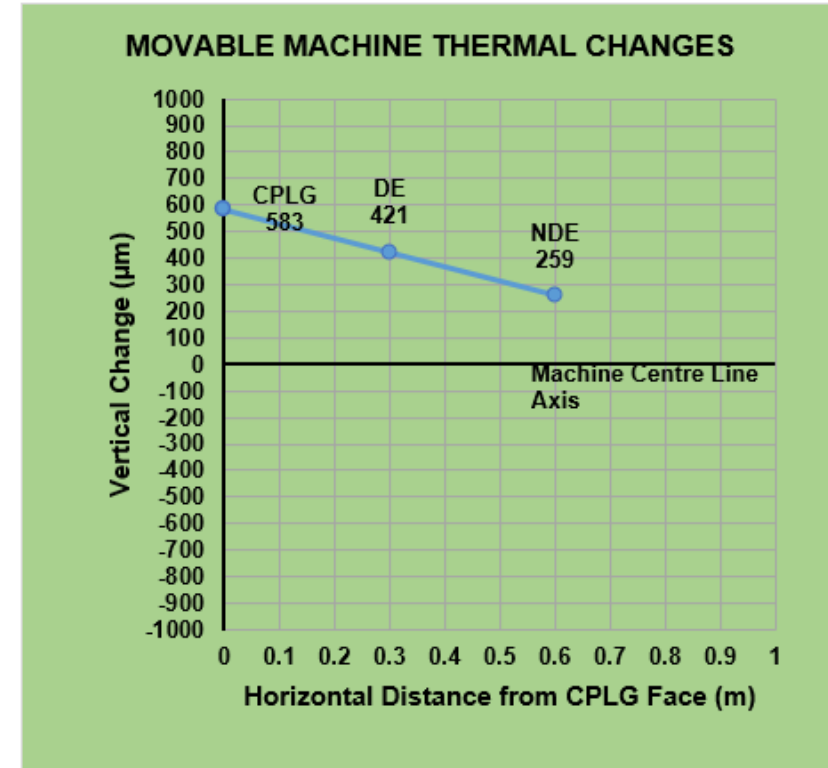
GRAPHICAL REPRESENTATION OF VERTICAL THERMAL CHANGES Slide 2/3

| | | |
|----------|--------|-------|
| Company: | Asset: | Date: |
|----------|--------|-------|

Slide 2



| SM Thermal Changes | | |
|--------------------|----------|-------------------|
| Posn | Dist (m) | Thermal Chng (µm) |
| NDE | | 259 |
| DE | 0.300 | 421 |
| CPLG | 0.600 | 583 |



| MM Thermal Changes | | |
|--------------------|----------|-------------------|
| Posn | Dist (m) | Thermal Chng (µm) |
| CPLG | | 583 |
| DE | 0.300 | 421 |
| NDE | 0.600 | 259 |

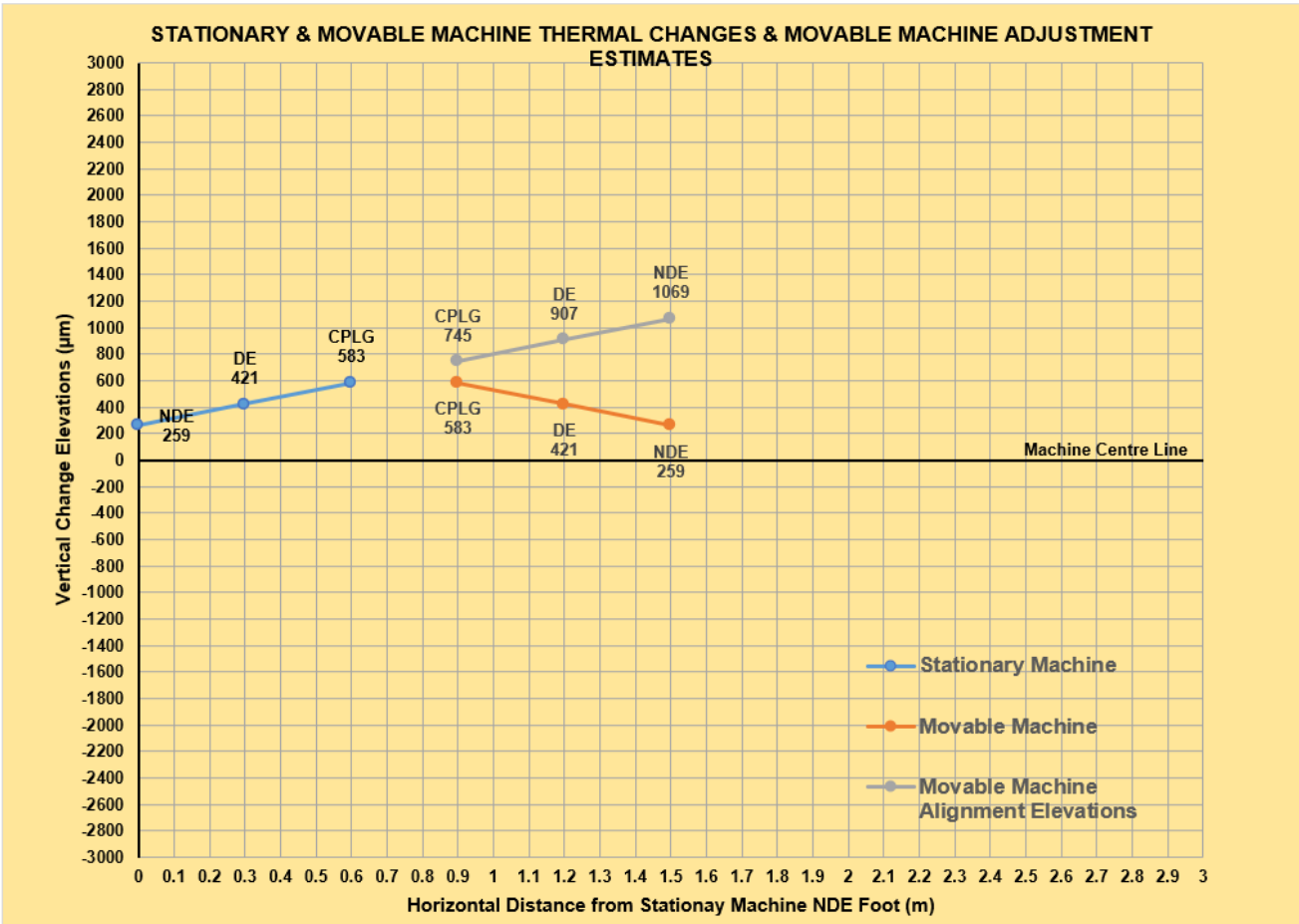
GRAPHICAL REPRESENTATION OF ALL VERTICAL THERMAL CHANGES & MOVABLE MACHINE ADJUSTMENT ESTIMATES Slide 3/3

Slide 2

Company:

Asset:

Date:



| MM Thermal Changes | | |
|--------------------|----------|-------------------|
| Posn | Dist (m) | Thermal Chng (µm) |
| CPLG | 0.900 | 583 |
| DE | 1.200 | 421 |
| NDE | 1.500 | 259 |

| Movable M/C Algmnt | Movable M/C Algmnt | Movable M/C Algmnt |
|--------------------|--------------------|--------------------|
| 745 µm | 907 µm | 1069 µm |

| IM CL Alignment Elevation | | |
|---------------------------|----------|----------------|
| Posn | Dist (m) | Elevation (µm) |
| CPLG | 0.900 | 745 |
| DE | 1.200 | 907 |
| NDE | 1.500 | 1069 |

| MM DE / NDE ~ Pkg Size (µm) | |
|-----------------------------|-----|
| DE | 486 |
| NDE | 810 |

MAINTENANCE / CONSTRUCTION JOB PLAN

Slide 2: Introduction

Slide 3: Worksheet 1. Job Overview *(image)*

Slide 4: Worksheet 2. Job Asset Details *(image)*

Slide 5: Worksheet 3. Job Support Document Links *(image)*

Slide 6: Worksheet 4. Job Activities and Resources 1/2 *(image)*

Slide 7: Worksheet 4. Job Activities and Resources 2/2 *(image)*

Slide 8: Worksheet 5. Job Notes and Tools *(image)*

Slide 9: Worksheet 6. Job Risk-Hazard Form *(image)*

Slide 10: Worksheet 7. Job Time and Cost Summary *(image)*

Slide 11: Worksheet 8. Job Spares and Materials *(image)*

Slide 12: Worksheet 9. Job Miscellaneous Costs *(image)*

Slide 13: Worksheet 10. Inspection and Test Plan Form *(image)*

Slide 14: Worksheet 11. Punch List Form *(image)*

Slide 15: Worksheet 12. Job Work Photos *(image)*

Slide 16: Worksheet 13. Job Work Report *(image)*

Slide 17: Worksheet 14. Job Supplementary Reports *(image)*

Slide 18: Worksheet 15. Risk-Hazard Criteria *(image)*

Slide 19: Worksheet 16. Associated Dropdown Lists *(image)*

Introduction

- ❑ Presentation outlines maintenance project / shutdown job planning / control using ***'MMAPS Maintenance / Construction Job Plan'*** workbook.
- ❑ Workbook comprises the following worksheets:
 - ***'1. Job Overview'***
 - ***'2. Job Asset Details'***
 - ***'3. Job Support Document Links'***
 - ***'4. Job Activities and Resources'***
 - ***'5. Job Notes and Tools'***
 - ***'6. Job Risk-Hazard Form'***
 - ***'7. Job Time and Cost Summary'***
 - ***'8. Job Spares and Materials'***
 - ***'9. Job Miscellaneous Costs'***
 - ***'10. Inspection and Test Plan Form'***
 - ***'11. Punch List Form'***
 - ***'12. Job Work Photos'***
 - ***'13. Job Work Report'***
 - ***'14. Job Supplementary Reports'***
 - ***'15. Risk-Hazard Criteria'***
 - ***'16. Associated Dropdown Lists'***
- ❑ Analysis worksheets' features include;
 - Multiple worksheet cell explanatory notes re spare parts analysis and worksheet usage.
 - Outline grouping of worksheet columns with second tier data (on which top tier data columns depend) to keep worksheet size manageable in terms of data entry and report printing etc.
 - Frequent use of cell dropdown lists to reduce effort and improve effectiveness. Columns with cell dropdown lists are shaded light green.
 - Frequent use of cell formulae to reduce effort and improve effectiveness. Columns with cell formulae are shaded light blue.
- ❑ Slides 2 to 19 show images of worksheets listed above i.e., basic worksheets with outline groups closed or open and if closed, separate images of expanded outline groups

| | A | B | C | D | E | F | G | H |
|----|---|---|---|---|---|---|---|---|
| 1 | MMAPS | | | | | | | |
| 2 | | MAINTENANCE / CONSTRUCTION JOB PLAN | | | | | | |
| 3 | | JOB OVERVIEW | | | | | | |
| 4 | | <i>MAIN INTERFACE WORKSHEET BETWEEN JOB PLAN & PROJECT CONTROL WORKBOOKS</i> | | | | | | |
| 5 | | Link to project control workbook at start of project or fill out manually for stand alone Job Plan - ref cell notes | | | | | | |
| 6 | Plant / Site: | | | | | | | |
| 7 | Job ID: | | | | | | | |
| 8 | Plant Area: | | | | | | | |
| 9 | Asset ID: | | | | | | | |
| 10 | Asset Description: | | | | | | | |
| 11 | Asset Type: | | | | | | | |
| 12 | Job Description: | | | | | | | |
| 13 | Job Type: | | | | | | | |
| 14 | Job Criticality: | | | | | | | |
| 15 | Account Code: | | | | | | | |
| 16 | | | | | | | | |
| 17 | Links to other worksheets in this workbook | | | | | | | |
| 18 | 2. Job Asset Details | | | | | | | |
| 19 | 3. Job Support Document Links | | | | | | | |
| 20 | 4. Job Activities and Resources | | | | | | | |
| 21 | 5. Job Notes and Tools | | | | | | | |
| 22 | 6. Job Risk-Hazard Form | | | | | | | |
| 23 | 7. Job Time and Cost Summary | | | | | | | |
| 24 | 8. Job Spares and Materials | | | | | | | |
| 25 | 9. Job Miscellaneous Costs | | | | | | | |
| 26 | 10. Inspection and Test Plan (ITP) Form | | | | | | | |
| 27 | 11. Punch List Form | | | | | | | |
| 28 | 12. Job Work Photos | | | | | | | |
| 29 | 13. Job Work Report | | | | | | | |
| 30 | 14. Job Supplementary Reports | | | | | | | |
| 31 | 15. Risk-Hazard Criteria | | | | | | | |
| 32 | 16. Associated Drop Down Lists | | | | | | | |

Link to appropriate '**Maint Project-SD Planning-Control**' workbook, worksheet '**4. 'Project-SD Overview**' appropriate row in cell **D5** or;
Enter data manually for isolated job plan.

Note:
Data cells in worksheets in this workbook are also linked to this cell.

| | A | B | C | D | E | F | G | H | I | J | K | L |
|----|-------------------------------------|-------------------|---|---|---------------------|-------------|----------|------------|-----------------|-------------|--------------|---|
| 1 | MMAPS | | | | | | | | | | | |
| 2 | MAINTENANCE / CONSTRUCTION JOB PLAN | | | | | | | | | | | |
| 3 | ASSET GROUP, PARENT, CHILD DETAILS | | | | | | | | | | | |
| 4 | | | | | | | | | | | | |
| 5 | Plant / Site: | | | | | | | | | | | |
| 6 | Job ID: | | | | | | | | | | | |
| 7 | Plant Area: | | | | | | | | | | | |
| 8 | Asset ID: | | | | | | | | | | | |
| 9 | Asset Description: | | | | | | | | | | | |
| 10 | Asset Type: | | | | | | | | | | | |
| 11 | Job Description: | | | | | | | | | | | |
| 12 | Job Type: | | | | | | | | | | | |
| 13 | Job Criticality: | | | | | | | | | | | |
| 14 | Account Code: | | | | | | | | | | | |
| 15 | | | | | | | | | | | | |
| 16 | Cells wirth drop down list | | | | Formula based cells | | | | 1. Job Overview | | | |
| 17 | | | | | | | | | | | | |
| | Line Item ID | Asset Description | | | | Asset Level | Asset ID | Asset Type | OEM Code | OEM Model # | OEM Serial # | |
| 18 | | Asset Description | | | | Asset Level | Asset ID | Asset Type | OEM Code | OEM Model # | OEM Serial # | |
| 19 | 1 | | | | | | | | | | | |
| 20 | 2 | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J |
|----|-------------------------------------|----------------------|---|---|-------------|---------------------------------|------|---|---|---|
| 1 | MMAPS | | | | | | | | | |
| 2 | MAINTENANCE / CONSTRUCTION JOB PLAN | | | | | | | | | |
| 3 | SUPPORT DOCUMENT LINKS | | | | | | | | | |
| 4 | | | | | | | | | | |
| 5 | Plant / Site: | | | | | | | | | |
| 6 | Job ID: | | | | | | | | | |
| 7 | Plant Area: | | | | | | | | | |
| 8 | Asset ID: | | | | | | | | | |
| 9 | Asset Description: | | | | | | | | | |
| 10 | Asset Type: | | | | | | | | | |
| 11 | Job Description: | | | | | | | | | |
| 12 | Job Type: | | | | | | | | | |
| 13 | Job Criticality: | | | | | | | | | |
| 14 | Account Code: | | | | | | | | | |
| 15 | | | | | | | | | | |
| 16 | Formula based cells | | | | | 1. Job Overview | | | | |
| 17 | | | | | | | | | | |
| | Line Item ID | Document Description | | | Document ID | | Link | | | |
| 18 | | | | | | | | | | |
| 19 | 1 | | | | | | | | | |
| 20 | 2 | | | | | | | | | |

MAINTENANCE / CONSTRUCTION JOB PLAN WORKBOOK

WORKSHEET 4. JOB ACTIVITIES AND RESOURCES 1/2

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MMAPS

Plant / Site:

Job ID:

Plant Area:

Asset ID:

Asset Description:

Asset Type:

Job Description:

Job Type:

Job Criticality:

Account Code:

MAINTENANCE /CONSTRUCTION JOB PLAN

ACTIVITIES & RESOURCES

Date:

IMPORTANT NOTE:

To insert new activity row in existing activity list:

1. Group 'Job Activities andResources', 'Job Notes and Tools' and 'Job Risk- Hazard Form' worksheets, place cursor at insertion point.

2. 'Insert New Row'.

3. Ungroup worksheets and correct fill / formatting for newly inserted

Cells with drop down lost

Formula based cells

Print As, landscape,

columns A to BK, grouped

columns C-G closed,

grouped columns BL-BP

closed (100% zoom) or open

1.Job Overview

Activities & Resources

Resource Quantities & Hours

Insert explanatory comments in respective resource hour cells if in-progress resource hour revisions are made

| Activity ID | Activity Description | MS Project Data | Precedence s / Dependenci es | Activity Duration | Fitter | Turner / Machinist | Welder | Mechanic | Refrig / Aircon Technician | Sheet Metal Worker | Carpenter | Plumber | Trades Assistant | Labourer | Instrument Technician | Electrician | NDE Technician | Inspector 1 | Inspector 2 | Safety Watch | Scaffolder | Rigger | Painter | Lagger | Crane 1 | Crane 2 | Forklift | Truck 1 | Truck 2 | Water Blaster | Other 1 | Other 2 | Other 3 | Other 4 | Total |
|--------------------------|----------------------|-----------------|------------------------------|-------------------|--------|--------------------|--------|----------|----------------------------|--------------------|-----------|---------|------------------|----------|-----------------------|-------------|----------------|-------------|-------------|--------------|------------|--------|---------|--------|---------|---------|----------|---------|---------|---------------|---------|---------|---------|---------|-------|
| 1 | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 2 | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 3 | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 4 | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 5 | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 6 | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 7 | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 8 | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 9 | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 10 | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 11 | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 12 | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 13 | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 14 | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 15 | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Total | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Resource Budget Rates | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Estimated Resource Costs | | | | | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | | |

al Est. Resource Cost

\$0

Resource Details

Inspector 1:

Inspector 2:

Crane 1:

Crane 2:

Truck 1:

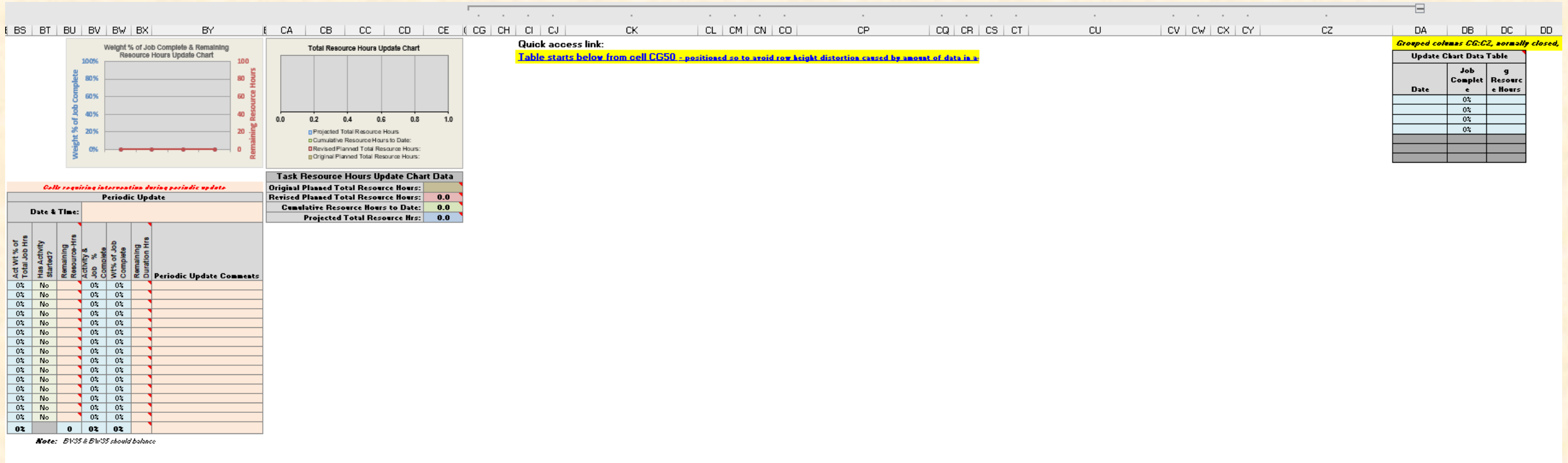
Truck 2:

Other 1:

Other 2:

Other 3:

Other 4:



Note:

This slide shows the analysis tools for periodic progress updating and the recording of such progress updates. Used for calculation only and not included in printouts.

[illegible]

| | | | | | | | |
|----|-------------------------------------|----------------------|-------|-------------------|---|---------------------------------|--|
| | A | B | C | D | E | F | |
| 1 | MMAPS | | | | | | |
| 2 | MAINTENANCE / CONSTRUCTION JOB PLAN | | | | | | |
| 3 | NOTES & TOOLS | | | | | | |
| 4 | | | | | | | |
| 5 | | Plant / Site: | | | | Date: | |
| 6 | | Job ID: | | | | | |
| 7 | | Plant Area: | | | | | |
| 8 | | Asset ID: | | | | | |
| 9 | | Asset Description: | | | | | |
| 10 | | Asset Type: | | | | | |
| 11 | | Job Description: | | | | | |
| 12 | | Job Type: | | | | Formula based cells | |
| 13 | | Job Criticality: | | | | | |
| 14 | | Account Code: | | | | 1. Job Overview | |
| 15 | | | | | | | |
| 16 | Activity ID | | | | | | |
| 17 | | Activity Description | Notes | Tools / Equipment | | | |
| 18 | 1 | | | | | | |
| 19 | 2 | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---|
| 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | 2 |
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| 17 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 23 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

MMAPS

MAINTENANCE / CONSTRUCTION JOB PLAN
RISK / HAZARD CONTROL

Plant / Site:
Job ID:
Plant Area:
Asset ID:
Asset Description:
Asset Type:
Job Description:
Job Type:
Job Criticality:
Account Code:

Date:

Cells with drop down lost
Formula based cells
14. Risk-Hazard Criteria
1. Job Overview

1 Conditional Formatting 25
Columns F,W

| Activity ID | Activity Description | Risk/Hazard | RISK | | | | | | | | | | Risk / Hazard Control | RISK | | | | | | | | | | Comments | | | |
|-------------|----------------------|-------------|-----------------|---------------|--------------------|----------------|---------------------|---------------------|--------------------------|--------------------------|------------------------|------------------------|-----------------------|-------------------------|-------------------------|----------------------|----------------------|-------------------------|-------------------------|--|--|--|--|----------|--|--|--|
| | | | Notifiable Work | Detectability | Highest Risk Score | Principal Risk | People Risk - Svnty | People Risk - Lklhd | Environment Risk - Svnty | Environment Risk - Lklhd | Equipment Risk - Svnty | Equipment Risk - Lklhd | | Production Risk - Svnty | Production Risk - Lklhd | Quality Risk - Svnty | Quality Risk - Lklhd | Reputation Risk - Svnty | Reputation Risk - Lklhd | | | | | | | | |
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|----|-------------------------------------|-------------|---------------|--------------|-------------|--------------|-------------|------------------|--------|---------------------|--------|--------------------|--------|---------|---------------------------------|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P |
| 1 | MMAAPS | | | | | | | | | | | | | | | |
| 2 | MAINTENANCE / CONSTRUCTION JOB PLAN | | | | | | | | | | | | | | | |
| 3 | JOB TIME & COST SUMMARY | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | | |
| 5 | Plant / Site: | | | | | | | | | | | | | | Date: | |
| 6 | Job ID: | | | | | | | | | | | | | | | |
| 7 | Plant Area: | | | | | | | | | | | | | | | |
| 8 | Asset ID: | | | | | | | | | | | | | | | |
| 9 | Asset Description: | | | | | | | | | | | | | | | |
| 10 | Asset Type: | | | | | | | | | | | | | | | |
| 11 | Job Description: | | | | | | | | | | | | | | | |
| 12 | Job Type: | | | | | | | | | | | | | | Formula based cells | |
| 13 | Job Criticality: | | | | | | | | | | | | | | | |
| 14 | Account Code: | | | | | | | | | | | | | | 1. Job Overview | |
| 15 | | | | | | | | | | | | | | | | |
| 16 | Resource Time & Cost Summary | | | | | | | Job Cost Summary | | | | | | | | |
| 17 | Resource | Budget Rate | Planned Hours | Planned Cost | Actual Rate | Actual Hours | Actual Cost | Resources Cost | | Spares & Matis Cost | | Miscellaneous Cost | | Total | | |
| 18 | Fitter | \$ - | 0 | \$ - | | | \$ - | Planned | Actual | Planned | Actual | Planned | Actual | Planned | Actual | |
| 19 | Turner / Machinist | \$ - | 0 | \$ - | | | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - | |
| 20 | | | | | | | | | | | | | | | | |

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MMAPS

MAINTENANCE / CONSTRUCTION JOB PLAN
SPARES & MATERIALS

Plant / Site:

Job ID:

Plant Area:

Asset ID:

Asset Description:

Asset Type:

Job Description:

Job Type:

Job Criticality:

Account Code:

Date:

Cells with drop down list

Formula based cells

Overall Availability Status: SCLCA

[1. Job Overview](#)

Use columns as appropriate for maintenance or construction jobs (optimised for maintenance)

| Line Item ID | OEM Code | OEM Assembly or Sub Assembly ID | OEM Assembly or Sub Assembly Description | OEM Part Number / Materials Code | OEM Part / Materials Description | Stock Code | Qty per Sub Assembly | Qty of Sub Assemblies | Total Reqd | Activity ID - W/sheets 4 | Requirement Probability | Unit Cost | Total Cost | Availability Status | Exp Lead Time Days | Order No | Actual Usage |
|--------------|----------|---------------------------------|--|----------------------------------|----------------------------------|------------|----------------------|-----------------------|------------|--------------------------|-------------------------|-----------|------------|---------------------|--------------------|----------|--------------|
| 1 | | | | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | | | | |

Select from drop down list:

ACA - All critical items available

ALCA - All less critical items available

ACLCA - All critical and less critical items available

SCA - Some critical items available

SLCA - Some less critical items available

SCLCA - Some critical and less critical items available

| | | | | | | | | | |
|----|-------------------------------------|-----------------------|---------------------------------|-------------------------|-----------|-------|--------------|-------------|---|
| | A | B | C | D | E | F | G | H | I |
| 1 | MMAPS | | | | | | | | |
| 2 | MAINTENANCE / CONSTRUCTION JOB PLAN | | | | | | | | |
| 3 | MISCELLANEOUS COSTS | | | | | | | | |
| 4 | | | | | | | | | |
| 5 | | Plant / Site: | | | | | | Date: | |
| 6 | | Job ID: | | | | | | | |
| 7 | | Plant Area: | | | | | | | |
| 8 | | Asset ID: | | | | | | | |
| 9 | | Asset Description: | | | | | | | |
| 10 | | Asset Type: | | | | | | | |
| 11 | | Job Description: | | | | | | | |
| 12 | | Job Type: | Formula based cells | | | | | | |
| 13 | | Job Criticality: | | | | | | | |
| 14 | | Account Code: | 1. Job Overview | | | | | | |
| 15 | | | | | | | | | |
| 16 | Line Item ID | Cost Item Description | Supplier | Activity ID - W/sheet 4 | Unit Rate | Units | Planned Cost | Actual Cost | |
| 17 | 1 | | | | | | \$ - | \$ - | |
| 18 | 2 | | | | | | \$ - | \$ - | |

| | A | B | C | D | E | F | G | H | I | J | K | L | M |
|----|--|--|----|---|---|---------------------|--------------------|-------------------------------------|-----------------------------------|------------------------------------|----------------------------------|----------|---|
| 1 | MMAPS | | | | | | | | | | | | |
| 2 | <div align="center"> MAINTENANCE / CONSTRUCTION JOB PLAN INSPECTION & TEST PLAN (ITP) </div> | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | |
| 6 | <u>INSPECTION / TEST POINT LEGEND</u> | | | Plant / Site: ITP Rev Date: H = HOLD POINT Job ID: W = WITNESS POINT Job Description: R = DOCUMENT REVIEW Person / Company Preparing ITP: <small>Cells with drop down list</small> S = SURVEILLANCE ITP Discipline / Type: <small>Formula based cells</small> ITP Rev No / Comment: 1. Job Overview | | | | | | | | | |
| 7 | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |
| 11 | | | | | | | | | | | | | |
| 12 | ITP Activity ID | Maintenance or Construction Activity Description | By | Inspection & Test Activity Description | Activity Control Procedure or Specification | Acceptance Criteria | Verifying Document | Job / Contract Personnel Insp Point | Job / Contract Personnel Initials | Insp / Client Personnel Insp Point | Insp / Client Personnel Initials | Comments | |
| 13 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | |
| 29 | | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | |
| 31 | ITPs provided by Contractors: Acceptance of this document by the Principal does not relieve the Contractor of responsibility for compliance with the terms and conditions of the Contract. Select appropriate acceptance box below. | | | | | | | Accepted / Approved By: | | | Date: | | |
| 32 | ACCEPTED. Work may proceed. <input type="checkbox"/> ACCEPTED AS NOTED, REVISE & RESUBMIT. Work may proceed. <input type="checkbox"/> NOT ACCEPTED, REVISE & RESUBMIT. Work may 'not' proceed. <input type="checkbox"/> | | | | | | | | | | | | |

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|----|--|-------------------------|----------------------------|---|------------------------|-------------|----------|----------------|-------------------------|--------------------|------------------------------|----------|---|-----------------|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N |
| 1 | MMAPS | | | | | | | | | | | | | |
| 2 | MAINTENANCE / CONSTRUCTION JOB PLAN | | | | | | | | | | | | | |
| 3 | PUNCH LIST (P/L) | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | Punchlist Date: |
| 5 | Plant / Site: | | | | | | | | | | | | | |
| 6 | Job ID: | | | | | | | | | | | | | |
| 7 | Job Description: | | | | | | | | | | | | | |
| 8 | Person / Company Doing Inspection: | | | | | | | | | | | | | |
| 9 | Punchlist Discipline/Type: | | | | | | | | | | | | | |
| 10 | Punchlist Rev No / Comment: | | | | | | | | | | | | | |
| 11 | <div>Formula based cells</div> <div>Cells with drop down list</div> | | | | | | | | | | | | | |
| 12 | Punchlist Item ID | Asset Drawing or Tag ID | Punchlist Item Description | | | Date Raised | Priority | Date Completed | Job Supervisor Initials | Inspector Initials | Other Initials (if required) | Comments | | |
| 13 | 1 | 2 | 3 | | | 4 | 5 | 6 | 7 | 8 | 9 | 10 | | |
| 27 | | | | | | | | | | | | | | |
| 28 | Inspection By: | | | | | | | | | | | | | |
| 29 | This punchlist is not to be considered final or complete and may be subject to the results of further inspection or testing. | | | | Inspector's Signature: | | | | | | | Date: | | |

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| 1 | MMAPS | | | | | | | | | | |
| 2 | MAINTENANCE / CONSTRUCTION JOB PLAN PHOTOS | | | | | | | | | | |
| 3 | | | | | | | | | | | |
| 4 | | | | | | | | | | | |
| 5 | | Plant / Site: | | | | | | | | | |
| 6 | | Job ID: | | | | | | | | | |
| 7 | | Plant Area: | | | | | | | | | |
| 8 | | Asset ID: | | | | | | | | | |
| 9 | | Asset Description: | | | | | | | | | |
| 10 | | Asset Type: | | | | | | | | | |
| 11 | | Job Description: | | | | | | | | | |
| 12 | | Job Type: | | | | | | | | | |
| 13 | | Job Criticality: | | | | | | | | | |
| 14 | | Account Code: | | | | | | | | | |
| 15 | | | | | | | | | 1. Job Overview | | |
| 16 | Organise and label photos in "before, during and after" sequence as required and/or use links appropriate | | | | | | | | | | |
| 32 | | | | | | | | | | | |
| 33 | | | | | | | | | | | |

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| 1 | MMAPS | | | | | | | | | | |
| 2 | MAINTENANCE / CONSTRUCTION JOB PLAN WORK COMPLETED REPORT | | | | | | | | | | |
| 3 | | | | | | | | | | | |
| 4 | | | | | | | | | | | |
| 5 | Plant / Site: | | | | | | | | | | |
| 6 | Job ID: | | | | | | | | | | |
| 7 | Plant Area: | | | | | | | | | | |
| 8 | Asset ID: | | | | | | | | | | |
| 9 | Asset Description: | | | | | | | | | | |
| 10 | Asset Type: | | | | | | | | | | |
| 11 | Job Description: | | | | | | | | | | |
| 12 | Job Type: | | | | | | | | | | |
| 13 | Job Criticality: | | | | | | | | | | |
| 14 | Account Code: | | | | | | | | | | |
| 15 | | | | | | | | | 1. Job Overview | | |
| 16 | Either configure worksheet for report or embed / link separate Word document depending on complexity. | | | | | | | | | | |
| 17 | | | | | | | | | | | |
| 18 | | | | | | | | | | | |

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| 1 | MMAPS | | | | | | | | | | |
| 2 | MAINTENANCE / CONSTRUCTION JOB PLAN SUPPLEMENTARY CHECKLISTS AND / OR REPORTS | | | | | | | | | | |
| 3 | | | | | | | | | | | |
| 4 | | | | | | | | | | | |
| 5 | | | | | | | | | | | |
| 6 | Plant / Site: | | | | | | | | | | |
| 7 | Job ID: | | | | | | | | | | |
| 8 | Plant Area: | | | | | | | | | | |
| 9 | Asset ID: | | | | | | | | | | |
| 10 | Asset Description: | | | | | | | | | | |
| 11 | Asset Type: | | | | | | | | | | |
| 12 | Job Description: | | | | | | | | | | |
| 13 | Job Type: | | | | | | | | | | |
| 14 | Job Criticality: | | | | | | | | | | |
| 15 | Account Code: | | | | | | | | | | |
| 16 | | | | | | | | | 1. Job Overview | | |
| 17 | <i>Insert scanned or object supplementary checklists and reports or links thereto below as required</i> | | | | | | | | | | |
| 18 | | | | | | | | | | | |

MAINTENANCE / CONSTRUCTION JOB PLAN WORKBOOK

WORKSHEET 15. RISK HAZARD CRITERIA

| | A | B | C | D | E | F | G | H | I | J | K | L | M |
|----|---|---|--|---------------------------------------|---------------------------------|-------------------------------------|--------------------------|------------------|-------------------|------------------------------|--------------------------|-----------------------------|------------------------------|
| 1 | MMAPS | | | | | | | | | | | | |
| 2 | MAINTENANCE / CONSTRUCTION JOB PLAN RISK-HAZARD CRITERIA | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | |
| 7 | RISK ASSESSMENT MATRIX | | | | | | | | | | | | |
| 8 | CONSEQUENCES / SEVERITY | | | | | | | LIKLIHOOD | | | | | |
| 9 | | People | Environment | Equipment | Production | Quality | Reputation | | Low / Rare | Low-Medium / Unlikely | Medium / Possible | Medium-High / Likely | High / Almost Certain |
| 10 | | | | | | | | | 1 | 2 | 3 | 4 | 5 |
| 11 | Catastrophic | Multiple fatalities | Major local pollution, prosecution probable | Extensive damage >\$100k | >10 days loss or delay | Reduced quality cost >\$100k | National impact | 5 | 5 | 10 | 15 | 20 | 25 |
| 12 | Major | Permanent disability / fatality | Significant local pollution off-site, prosecution possible | Major damage >\$50k <\$100k | >3 days <10 days loss or delay | Reduced quality cost <\$50k <\$100k | Regional impact | 4 | 4 | 8 | 12 | 16 | 20 |
| 13 | Moderate | Lost Time Injury | Localised on & off site pollution, prosecution unlikely | Significant damage >\$10k <\$50k | >1 <3 days loss or delay | Reduced quality cost >\$10k <\$50k | Significant local impact | 3 | 3 | 6 | 9 | 12 | 15 |
| 14 | Tolerable | Medical Treatment | Medium spill or emission on-site within consent limits | Minor or moderate damage >\$5k <\$10k | >4 hours <8 hours loss or delay | Reduced quality cost >\$5k <\$10k | Minor local impact | 2 | 2 | 4 | 6 | 8 | 10 |
| 15 | Insignificant | Zero Harm / First Aid Treatment | Minor spill or emission on-site within consent limitations | Minimal or no damage | <4 hours loss or delay | Reduced quality cost <\$5k | Minimal or no impact | 1 | 1 | 2 | 3 | 4 | 5 |
| 16 | Notifiable Work Drop Down List Based on Worksafe Form: | | | | | | | | | | | | |
| 17 | No | None | | | | | | | | | | | |
| 18 | A | Work involving asbestos fibre | | | | | | | | | | | |
| 19 | BA | Work involving compressed breathing air | | | | | | | | | | | |
| 20 | D | Work involving use of explosives or storage of explosives at worksite | | | | | | | | | | | |
| 21 | E | Work in any drive, excavation or heading where person works with ground cover overhead Work in excavation, trench or pit > 1.5m deep and depth > horizontal width at top Work in any excavation with any face > 5m vertical height and average slope steeper than ratio of 1 horizontal to 2 vertical | | | | | | | | | | | |
| 22 | H | Construction work with risk of falls > 5m except for residential building up to 2 full stories, overhead power / telecom lines, work from ladder only | | | | | | | | | | | |
| 23 | LA | Use of lifting appliance other than forklift, mobile crane or excavator to lift mass => 500kg a vertical distance => 5m | | | | | | | | | | | |
| 24 | SC | Scaffold erection/dismantling with risk of falls > 5m | | | | | | | | | | | |

[6. Risk-Hazard Form](#)[1. Job Overview](#)

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MMAPS

MAINTENANCE / CONSTRUCTION JOB PLAN

DROP DOWN LISTS

1.Job Overview

ACTIVITIES & RESOURCES DROP DOWN LISTS (5)

SPARES & MATERIALS DROP DOWN LISTS (4)

PUNCHLIST DROP DOWN LISTS (2)

ITP DROP DOWN LIST (1)

RISK DROP DOWN LISTS (4)

WORK PERMIT TYPES (2)

YesorNo

Probability

Discipline/Type

Priority

Inspection Criteria

Severity

Likelihood

Detectability

Principal Risk

Work Permit Type

Work Permit Extension Type

Yes

No

Indent Level

1

2

3

4

Job Summary Activity

Job Milestone

Activity Group Summary Activity

Activity Group Sub Activities

Asset Level

G

P

C

Child

S

Shipped

Asset Type (site specific)

Overall Availability Status

ACA

ALCA

ACLCA

SCA

SLCA

SCLCA

OEM Codes - Site / Plant Specific

Code

Full Name

1

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7

8

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Critical - definitely required

Less Critical - definitely required

Possibly required

Insurance spare

Item Availability Status

IS

OS

SUP

O

YTO

All critical items available

All less critical items available

All critical and Less critical items

Some critical items available

Some less critical items available

Some critical and less critical items

Hold Point

Witness Point

Document Review

Surveillance

1

2

3

4

5

1

2

3

4

5

Detectable

detectable

Possibly

Undetectable

P

EN

EQ

P

Q

People

Environment

Equipment

Production

Quality

Reputation

[1. Job Overview](#)

MAINTENANCE PROJECT / SHUTDOWN JOB PLANNING / CONTROL

Slide 2: Introduction

Slide 3: Maintenance Project / Shutdown Preparation Flow Chart

Slide 4: Maintenance Project / Shutdown Execution Flow Chart

Slide 5: Maintenance Project / Shutdown Job Planning & Control System

Slide 6: Worksheet '4. Project-SD Overview' (*image*)

Slide 7: Worksheet '5. Project-SD Cost Summary' (*images*)

Slide 8: Worksheet '7. Project-SD Timesheet Summary' - Basic Worksheet - Outline Groups Closed (*image*)

Slide 9: Worksheet '7. Project-SD Timesheet Summary' - Outline Groups Expanded (*images*)

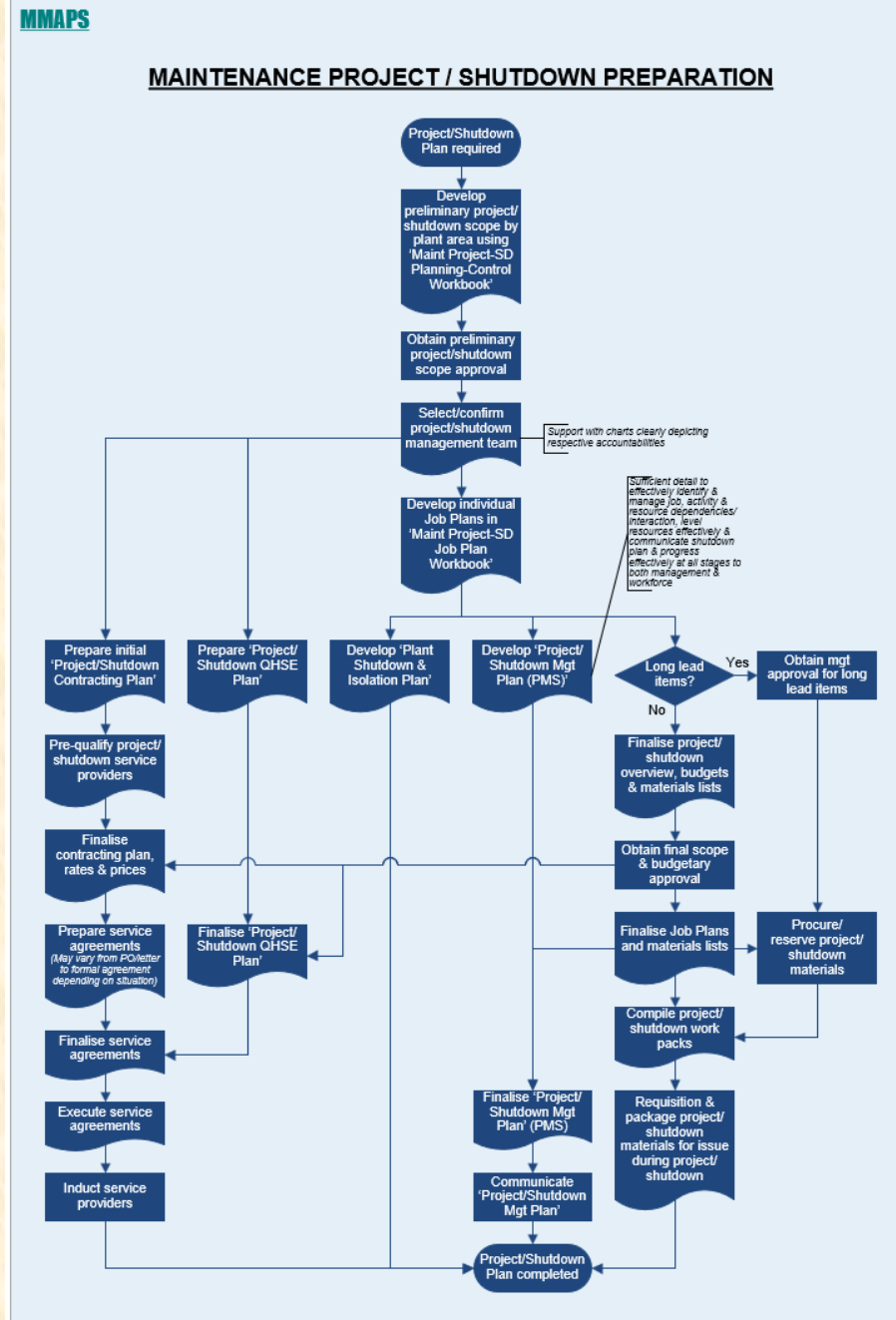
Slide 10: Worksheet '8. Project-SD Resources' (*image*)

Slide 11: Worksheet '9. Project-SD Spares and Materials' (*image*)

Slide 12: Worksheet '10. Associated Dropdown Lists' (*image*)

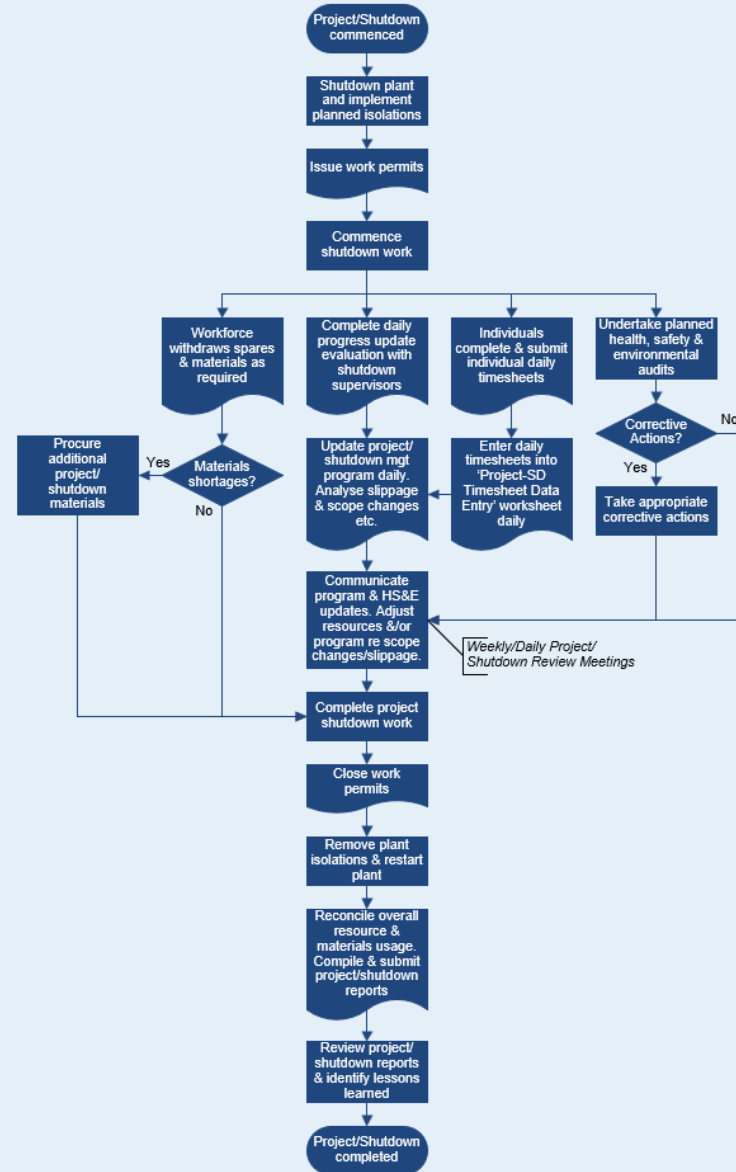
Introduction

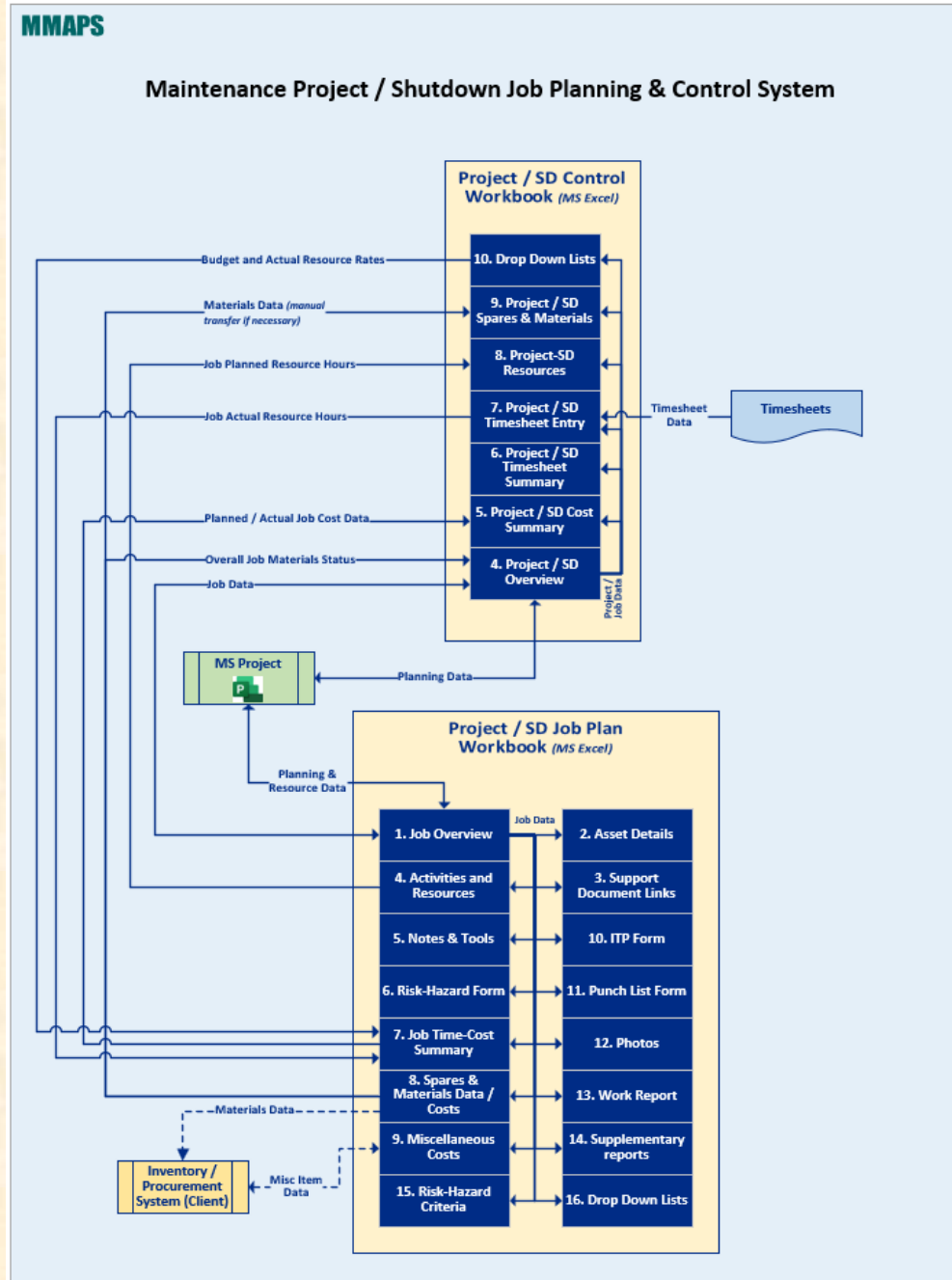
- ❑ Presentation outlines maintenance project / shutdown job planning / control using '**MMAPS Project-Shutdown Job Planning-Control**' workbook.
- ❑ Workbook comprises the following worksheets:
 - '**1. Project-SD Preparation Flow Chart**'
 - '**2. Project-SD Execution Flow Chart**'
 - '**3. Project-SD Planning-Control System**'
 - '**4. Project-SD Overview**'
 - '**5. Project-SD Cost Summary**'
 - '**6. Project-SD Timesheet Summary**'
 - '**7. Project-SD Timesheet Entry**'
 - '**8. Project-SD Resources**'
 - '**9. Project-SD Spares and Materials**'
 - '**10. Associated Dropdown Lists**'
- ❑ Analysis worksheets' features include;
 - Multiple worksheet cell explanatory notes re spare parts analysis and worksheet usage.
 - Outline grouping of worksheet columns with second tier data (on which top tier data columns depend) to keep worksheet size manageable in terms of data entry and report printing etc.
 - Frequent use of cell dropdown lists to reduce effort and improve effectiveness. Columns with cell dropdown lists are shaded light green.
 - Frequent use of cell formulae to reduce effort and improve effectiveness. Columns with cell formulae are shaded light blue.
- ❑ Slides 3 to 12 show images of worksheets listed above i.e., basic worksheets with outline groups closed and also separate images of expanded outline groups



MMAPS

MAINTENANCE PROJECT / SHUTDOWN EXECUTION





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| | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R |
| 1 | | | | | | | | | | | | | | | | | 1. Project-SD Prep FlowChart |
| 2 | | | | | | | | | | | | | | | | | 2. Project-SD Executn FlowChart |
| 3 | | | | | | | | | | | | | | | | | 3. Project-SD Plan'g-Cntrl Syst |
| 4 | | | | | | | | | | | | | | | | | 5. Project-SD Cost Summary |
| 5 | | | | | | | | | | | | | | | | | 6. Project-SD Timesheet Summary |
| 6 | | | | | | | | | | | | | | | | | 7. Project-SD Timesheet Entry |
| 7 | | | | | | | | | | | | | | | | | 8. Project-SD Resources |
| 8 | | | | | | | | | | | | | | | | | 9. Project-SD Spares and Matls |
| 9 | | | | | | | | | | | | | | | | | 10. Associated Drop Down Lists |
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| 2 | MAINTENANCE / CONSTRUCTION PROJECT / SHUTDOWN CONTROL | | | | | | | | | | |
| 3 | COST SUMMARY | | | | | | | | | | |
| 4 | | | | | | | | | | | |
| 5 | Date: | | | | | | | | | | |
| 6 | Plant / Site: | | | | | | | | | | |
| 7 | Project ID: | | | | | | | | | | |
| 8 | Project Name: | | | | | | | | | | |
| 9 | Link to Job Plans at start of project (ref cell notes) | | | | | | | | | | |
| 10 | Link to Job Plans at start of project (ref cell notes) | | | | | | | | | | |
| 11 | Job ID | Job Description | Account Code | Resource Job Cost Planned | Materials Job Cost Planned | Misc Job Cost Planned | Total Job Cost Planned | Resource Job Cost Actual | Materials Job Cost Actual | Misc Job Cost Actual | Total Job Cost Actual |
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Formula based cells
[4. Project-SD Overview](#)

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MMAAPS

MAINTENANCE / CONSTRUCTION PROJECT / SHUTDOWN CONTROL
TIMESHEET DATA ENTRY & ANALYSIS

Date:

Plant / Site:

Project ID:

Project Name:

Cells with drop down list

Formula based cells

[4. Project-SD Overview](#)

TIMESHEET DATA ENTRY

| Date | JobID | Act ID | Name | Company | Resource Type | Actual Rate | Hours | Cost |
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Timesheet Hours Analysis: Grouped Columnns K:AO

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Timesheet Cost Analysis: Grouped Columnns AQ:BT

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MAINTENANCE / CONSTRUCTION PROJECT/SHUTDOWN CONTROL
DROP DOWN LISTS

[4. Project-SD Overview](#)

| | | | | | | | | | | | |
|----------------------------|-----|--------------------------|--|-----------------------|--|-------------|------|--|---------|---------------|-------------|
| Job Type | | Job Criticality | | ResourceTypeB | | Budget Rate | Name | | Company | ResourceTypeA | Actual Rate |
| Corrective Inspection | CI | 1 | Critical - must complete, timing critical | Fitter | | | | | | | |
| Corrective Repair | CR | 2 | Critical - must complete, timing less critical | Turner / Machinist | | | | | | | |
| New Installation | NI | 3 | Not Critical - must complete if possible | Welder | | | | | | | |
| Plant Modification | PM | 4 | Not critical - complete if time and resources permit | Mechanic | | | | | | | |
| Predictive Maintenance | PdM | | | Refrig / Aircon Tech | | | | | | | |
| Preventive Correction | PC | Requirement Probability | | Sheet Metal Worker | | | | | | | |
| Preventive Inspection | PI | 1 | Critical - definitely required | Carpenter | | | | | | | |
| Preventive Overhaul | PO | 2 | Less Critical - definitely required | Plumber | | | | | | | |
| Preventive Statutory | PS | 3 | Possibly required | Trades Assistant | | | | | | | |
| Other | | 4 | Insurance spare | Labourer | | | | | | | |
| Other | | | | Instrument Technician | | | | | | | |
| Other | | | | Electrician | | | | | | | |
| | | Item Availability Status | | NDE Technician | | | | | | | |
| Asset Type (site specific) | | IS | In store | Inspector 1 | | | | | | | |
| | | OS | On site | Inspector 2 | | | | | | | |
| | | SUP | In stock at local supplier | Safety Watch | | | | | | | |
| | | O | Ordered | Scaffolder | | | | | | | |
| | | YTO | Yet to order | Rigger | | | | | | | |
| | | S | Shipped | Painter | | | | | | | |
| | | | | Lagger | | | | | | | |
| | | | | Crane 1 | | | | | | | |
| | | | | Crane 2 | | | | | | | |
| | | | | Forklift | | | | | | | |
| | | | | Truck 1 | | | | | | | |
| | | | | Truck 2 | | | | | | | |
| | | | | Water Blaster | | | | | | | |
| | | | | Other 1 | | | | | | | |
| | | | | Other 2 | | | | | | | |
| | | | | Other 3 | | | | | | | |
| | | | | Other 4 | | | | | | | |

| COMPOSITE RATE CALCULATOR | | | | | |
|---------------------------|------|--------|----------|-------------|-----------|
| Pay / Invoice Rates | | | Weekly | Weekly Pay/ | Composite |
| Category | Rate | Factor | Work Hrs | Invoice Hrs | Rate |
| Base Rate | | 1 | | 0.00 | |
| OT Rate 1 | | | | | |
| OT Rate 2 | | | | | |
| Total | | | 0.00 | 0.00 | |