Notes For Instructors

Course Materials
- Course materials include:
  - this Instructor’s Manual
  - the Student Manual
  - the Workshop Materials
  - the presentation Slides – as a PPT or a pdf document
- All are available on the Vale Extranet site under to Contractor Portal at http://extportal.vale.com/PMO/ (Forms tab)
- Note that the PHR Program and related documents are continually being updated - printed copies of the course materials may not reflect the latest versions of these documents!

Master Index
- The Master Index lists the materials included in each package
  - See the last page of Instructor’s Manual for Printing Instructions for each Manual

Slide Presentation Notes
- “Speakers Notes” pages are included in most sections of the Instructors Manual
  - They appear on the page facing the related Slide (ie. the back of the page before that Slide)
  - Items in Red are instructions to you - they should not be read aloud
  - Items in Black should be mentioned
  - Items in (italics) are the (expected responses to questions) … prompt for them, or “feed” them to the class
- Slide Transitions are included in the PPT file
  - Different types of transitions are used to signal main Agenda Dividers vs. section items vs. sub-sections
  - Click the mouse to advance between slide “bullets” … transition timers were not used
<table>
<thead>
<tr>
<th>Section</th>
<th>Slides</th>
<th>Instructors Manual</th>
<th>Student's Manual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title Slide – Instructor’s Manual</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Title Slide – Student Manual</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Notes For Instructors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Master Index</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preface</td>
<td>✓ “Student Manual”</td>
<td>✓ “Instructor’s” w/ S.N.</td>
<td>✓</td>
</tr>
<tr>
<td>Agenda – Divider</td>
<td>✓ Green</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guide</td>
<td></td>
<td>✓ with Speakers Notes</td>
<td></td>
</tr>
<tr>
<td>Index</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safety Share Slide</td>
<td>✓</td>
<td></td>
<td>✓ with Speakers Notes</td>
</tr>
<tr>
<td>Key Concepts – Divider</td>
<td>✓ Green</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Key Concepts</td>
<td>✓</td>
<td>✓ with Speakers Notes</td>
<td>✓</td>
</tr>
<tr>
<td>Reference Material – Divider</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHR Program / Guidelines Documents</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHR Template – Divider</td>
<td>✓ Green</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>PHR Template – all tabs</td>
<td></td>
<td></td>
<td>✓ with Speakers Notes</td>
</tr>
<tr>
<td>Workshop – Divider</td>
<td>✓ Green</td>
<td>✓ with Speakers Notes</td>
<td></td>
</tr>
<tr>
<td>Workshop Materials</td>
<td>✓</td>
<td>✓ with Speakers Notes</td>
<td>(One copy per table)</td>
</tr>
<tr>
<td>Recap – Divider</td>
<td>✓ Green</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Recap</td>
<td>✓</td>
<td>✓ with Speakers Notes</td>
<td>✓</td>
</tr>
<tr>
<td>End Slide</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The Purpose of this Training is to explain how PHR’s (Process Hazard Reviews) work at Vale

- Key concepts
- How to prepare for and how to participate in PHRs
- How to communicate hazards and controls to workers

**

- Ask questions at any time!
- You’re here to participate – and to learn from each other
- The course materials are also available at the Vale Extranet site listed in your Manuals
Preface – Instructor’s Manual

Purpose of the Training

– To improve your understanding of the PHR process used at Vale
  • Key PHR concepts
  • How to prepare for and how to participate in PHRs
  • How to communicate hazards and controls to workers

– To prepare you to train others in your organization
  • Trainees must review the PHR Core Knowledge Training Computer Based Training (CBT) at http://extportal.vale.com/PMO/ (Training & Presentations tab) beforehand
  • You should also review that CBT, and the PHR Program and Guideline documents included in this Instructors Manual before doing the training
  • Contact Trueman Hirschfeld at 705-682-6496 or trueman.hirschfeld@vale.com for further guidance.

Notes

– Ask questions at any time!
– You are here to participate – and to learn from each other
Session Notes
- This training session will last about 4 hours (8am to noon)
- We’ll take a 15-minute break mid-way through

The Agenda for today’s training includes:
- a review of some Key Concepts for PHR’s – about 45 minutes
- a review of the PHR Template and how to use it – about 1 hour
- a Workshop where we’ll practice those steps – about 1 hour
- and then we’ll do a Recap of the training for the last ½ hour or so

Also review the following items if they apply:

Facility Notes
- INVAC / OUTVAC locations, sign-in requirements, etc...
- Washrooms, Smoking Area locations, other

Introductions
- Instructor Name, Background (optional)
- Assistant Names (if used) - their role is to assist during the workshop
- Participant Introductions (optional)
1. Key PHR Concepts
2. PHR Program
3. PHR Guidelines
   - Design
   - Construction / Commissioning
4. PHR Template
5. Workshop Materials
6. Recap

* - with Speakers Notes
1. Key PHR Concepts
2. PHR Program
3. PHR Guidelines
   - Design
   - Construction / Commissioning
4. PHR Template
5. Recap
Safety Share

– Ask attendees for a QUICK Safety Share

Train-the-Trainer Session only – show 2 minute video of Alabama Chimney Demo

Points:

– this was the owner of a licensed Demolition Contracting company … in Alabama

– Chimney was to be taken down with explosives … imploding it

– That didn’t work …

– Plan “B” – he blasted it again …. That didn’t work either !! …

– Plan “C” = NO PLAN … “I’ll just use the excavator …” … “my ROPS cage will keep me safe”

– These sorts of things happen on our jobsites too!
Safety Share
Key Concepts – Speaker’s Notes

We’ll spend the next ½ hour or so reviewing these Key Concepts

- What Are PHR’s?
- Why do we do PHR’s?
- How we do them?
- and … How will we get the best results?

So … Why Do PHR’s?  (Click mouse to advance to the next slide)
1. Why We Do PHR’s
2. What PHR’s Are
3. How PHR’s Are Done
4. How to Get the Best Results
Why Do PHR’s – Speaker’s Notes

To Get to Zero Harm

– What do we mean by Zero Harm?  (... *Don’t hurt people* ...) 

By Managing Risk

– How do we do that?
– By Communicating Hazards & Controls!

...to who?  (... *Workers, Others in the area, Future Users, etc*...) 

So … WHAT are PHR’s?
PHR Key Concepts

Why Do PHR’s?

– To get to Zero Harm!
  • Don’t hurt people
  • Don’t damage equipment, property, or the environment
  • Don’t cause process delays

– By Managing Risk
  • Identify Hazards
  • Identify Controls
  • Communicate those Hazards & Controls
  • and … Follow up!
What Are PHR’s – Speaker’s Notes

PHR’s … Process Hazard Reviews … are a Risk Management Tool

- What are other Risk Management tools do we use?
  
  (... Procedures, JHA’s, SLAM’s, Inspections, audits, etc…)

- PHR’s should be used together with the Contract-specific Safety Plan and these other tools

PHR’s are also a Due Diligence Tool

- Is that important?
  
  (... Yes, legal defense in case something bad does happen …)

- But, remember - why did we say we do PHR’s?
  
  (... to Get to Zero Harm … or … to Not Hurt People …)

So … How are PHR’s done?
PHR Key Concepts

What Are PHR’s?

- PHR’s are a Risk Management tool
  - PHR’s help Identify and Manage Risks
  - Along with:
    - Contract-specific Safety Plans
    - Training, Procedures & JHA’s
    - Audits & Inspections
    - Safety Talks, Toolbox Talks, etc …

- PHR’s are also a Due Diligence tool
  - Document Hazards & Controls
    … and the worker reviews / signoffs
  - *This is NOT their main purpose, though!*
Read the Slide bullets aloud … emphasize the words in brackets

- This is the “meat and potatoes” of the training
- We’ll review each of these points in a lot more detail throughout the session

Before moving to the next slide …

PHR’s are Important!

- Vale has trained over 500 facilitators at 8 hrs each … that’s about $40k
- More than 500 PHRs a year are done … if there’s 5 people, at 2 hours each, plus prep time, plus reviews with the workers … that’s way over $500k per year, for just the man-hours!
  … And why do we do PHR’s? (to get to Zero Harm … to not hurt people …)
- So let’s make sure we do a good job!

So … How Do we Get the Best Results?  (Click mouse to advance to the next slide)
PHR Key Concepts

How Are PHR’s Done?

– Prepare for the meeting
  • Gather the reference materials (Scope of work, drawings, photos, etc…)
  • Prepare a Draft PHR and review with the Vale Rep (Pre-Screening)

– Get the right people together (Attendees)

– At the PHR Meeting, review
  • What work is being done (Scope Overview)
  • How, Where, When and by Who (Methodology)
  • The Hazards (What If … ?)
  • The Controls that are already in place (Existing Protection)
  • What other Controls are needed (Action Items)

– Communicate to
  • Workers
  • Other stakeholders
How To Get The Best Results – Speaker’s Notes

Preparing For the Meeting

– What should we review before the PHR?
  
  (... Scope of Work, Drawings, Photos, Procedures, etc...)

– Who do you think should prepare the Draft (Pre-Screened) PHR?
  
  (... Vale Rep, Contractor’s Supervisor, Safety Coordinator, and/or anyone else with the required knowledge ...)

Getting the Right People Together

– Who is normally involved in PHR’s?
  
  (... PMO Rep, Vale Operations / Mtce / Engineers / others ... Contractor Supervisors / SHE Coordinators / others ... Sub-contractor Reps / Crane Operators / Equip. Reps ...)

– Remember to consider the Work-ers - think about the hazards of new/young workers on the job or workers from out of town ... what other controls might need to be in place?
  
  (... buddy system ... more supervision ... jobsite orientation ... etc...)
PHR Key Concepts

How Do We Get the Best Results?

– Prepare for the meeting
  • Attendees need to prepare too - review the Pre-Screened PHR & reference materials
  • More than one meeting may be needed for large / complex jobs

– Get the right people together
  • To understand the Hazards and the Controls for
    – the work,
    – the workplace, and
    – the workers
How To Get The Best Results – Speaker’s Notes

At the PHR Meeting

– The Vale Rep will Facilitate the meeting. What do mean by Facilitate?
  
  (… Help, Guide, “Get it Done” …)

– Who will do most of the talking at the PHR meeting?
  
  (… It depends … Whoever has the required knowledge …)

– Are we here to solve Global Warming or World Hunger at the PHR meeting? (… No …)

The “Parking Lot”

– Is a list on a flip-chart or a notebook, to record items that require long discussion – or when the required people aren’t in the room

Communicate

– Every group, trade and company has their own terminology and short forms – including Vale!

– Have you ever been mystified by someone else’s jargon?
  
  (… JHSC, CPQQTR, RFI, …)

– Remember that Workers might be afraid of looking stupid and not ask what something stands for or what something means … and then they might miss something important!
PHR Key Concepts

How Do We Get the Best Results?  Continued …

– At the PHR Meeting
  • Make sure everyone understands the Scope and Methodology
  • Participate, and encourage others to participate
  • Don’t take over the meeting
  • *If needed, the Facilitator may assign an item to the “Parking Lot”*

– Communicate
  • *Remember who the PHR is for*
    … *those doing the work, and others that could be affected!*
  • Use clear, simple wording
  • Avoid acronyms and jargon
  • Focus on the critical items … don’t include the “chickenfeed”
How To Get The Best Results – Speaker’s Notes

Follow Up

– If we don’t complete the Action Items, did we do our job?

  (... No! …)

– Why is it important to Audit?

  (... People forget … Action Items might not be understood … to prevent Harm…)

Any Questions so Far?
PHR Key Concepts

How Do We Get the Best Results? Continued …

– Follow Up
  • Make sure Action Items are done
  • A PHR Field Audit form is included in the Template
  • *If conditions change, a new / revised PHR may be needed*

– **NOTE**: no two PHR’s are ever EXACTLY the Same
  • The same job done a different day usually has some different hazards
  • A similar job, done in a different place, on a different day, with a different crew may have very different Hazards and Controls
  • *Always remember … “It depends on the circumstances”*
The next section of your books includes some reference material:

- Vale’s PHR Program document
- The PHR Guidelines for
  - Design PHR’s, and
  - Construction & Commissioning PHR’s
- They contain more details on various aspects of PHR’s
- We won’t have time to read these during the training
  - Please review them on your own when you have time

Before moving to the next slide …

Next, we’ll review the PHR Template, and how to use it.
1. PHR Program document

2. PHR Guidelines
   - Design
   - Construction / Commissioning
PHR PROGRAM

1.0 INTRODUCTION

A number of risk management tools are used in Vale’s Ontario Operations. Each is intended to help provide employees and contractors on site with safe workplaces, and to safeguard the public, the natural environment, and company assets.

A Process Hazards Review (PHR) is a systematic method of hazard identification, assessment and control. Typically, a hazards checklist is used to trigger "What-If" questions, in a multidisciplined group meeting. Other tools may also be incorporated where appropriate, such as the HAZOP template. A well-done PHR will highlight all foreseeable hazards and the appropriate controls to be put in place before or during the work.

This document outlines the PHR Program, including roles and responsibilities of key personnel, PHR methodology, and training & recordkeeping requirements. Also refer to the Reference documents for further details.

TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0 INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>2.0 POLICY STATEMENT</td>
<td>2</td>
</tr>
<tr>
<td>3.0 PURPOSE</td>
<td>2</td>
</tr>
<tr>
<td>4.0 SCOPE</td>
<td>2</td>
</tr>
<tr>
<td>5.0 LEGAL AND OTHER REQUIREMENTS</td>
<td>2</td>
</tr>
<tr>
<td>6.0 ROLES AND RESPONSIBILITIES</td>
<td>3</td>
</tr>
<tr>
<td>6.1 Maintenance &amp; Engineering Dept. Responsibilities (PMO Group)</td>
<td>3</td>
</tr>
<tr>
<td>6.2 Plant / Department Responsibilities</td>
<td>3</td>
</tr>
<tr>
<td>6.3 Learning and Development Dept. Responsibilities</td>
<td>3</td>
</tr>
<tr>
<td>6.4 PHR Facilitators</td>
<td>3</td>
</tr>
<tr>
<td>6.5 PHR Participants</td>
<td>4</td>
</tr>
<tr>
<td>7.0 METHODOLOGY</td>
<td>4</td>
</tr>
<tr>
<td>7.1 FEL Study PHR’s</td>
<td>4</td>
</tr>
<tr>
<td>7.2 Detail Design PHR’s</td>
<td>5</td>
</tr>
<tr>
<td>7.3 Construction PHR’s</td>
<td>5</td>
</tr>
<tr>
<td>7.4 Commissioning PHR’s</td>
<td>6</td>
</tr>
<tr>
<td>7.5 PHR Follow-up</td>
<td>7</td>
</tr>
<tr>
<td>8.0 RECORD KEEPING AND DATA MANAGEMENT</td>
<td>7</td>
</tr>
<tr>
<td>9.0 COMMUNICATION AND CONSULTATION</td>
<td>7</td>
</tr>
<tr>
<td>10.0 TRAINING</td>
<td>7</td>
</tr>
<tr>
<td>11.0 PROGRAM EVALUATION AND AUDIT</td>
<td>8</td>
</tr>
<tr>
<td>12.0 REFERENCES</td>
<td>9</td>
</tr>
<tr>
<td>13.0 APPENDICES</td>
<td>10</td>
</tr>
<tr>
<td>Appendix 1 – DEFINITIONS</td>
<td>10</td>
</tr>
<tr>
<td>14.0 REVISIONS</td>
<td>11</td>
</tr>
</tbody>
</table>
2.0 POLICY STATEMENT

Process Hazard Reviews will be done as per the standards provided in this Program document and the listed Reference documents.

3.0 PURPOSE

The purpose of a PHR is to identify and assess the hazards associated with the work to be done, and determine the required control measures.

4.0 SCOPE

The PHR Program applies to all workers and all workplaces in Vale’s Ontario Operations.

Process Hazards Reviews must be conducted for:
- All PMO Projects at the Detail Design, Construction, and Commissioning stages, and during the final FEL Study stage,
- All Detail Design Engineering packages,
- Work managed by other departments where required as an outcome of a JHA/SSA, MOC review, or other risk management tool, or
- Where otherwise required by local Plant or Department policies.

PHR’s should also be completed for:
- Any activity that poses significant and/or unusual hazards, e.g. Non-routine Hazardous tasks.

5.0 LEGAL AND OTHER REQUIREMENTS

No specific legal requirements exist. However, the following stipulate a general duty of care that is best met by applying sound risk management principles:
- The Occupational Health and Safety Act, Mining Regulations 854
- The Occupational Health and Safety Act, Construction Regulations 213/91

In general, Employers and Constructors must ensure that Supervisors:
- Identify and control all hazards in their workplaces,
- Advise workers of potential or actual hazards they may be exposed to in those workplaces,
- Ensure that workers use recommended control measures, and
- Monitor their workplaces for changes in conditions that may require re-assessment of hazards or implementation of other controls.

The PHR process provides an excellent tool for identifying hazards and control measures, and can serve as an audit tool to check for emerging or unrecognized hazards in the workplace.

5.1 Pre-Development Reviews for Project Work

The PHR process meets the regulatory requirements for conducting a Pre-development Review, as per O. Reg.854 s.5 (2.1), as long as the JHSC Representative either attends or is officially
notified. Refer to the Pre-development Review Guideline (NAV-GP-0075) for the 9 triggers to identify the requirements of a PDR.

6.0 ROLES AND RESPONSIBILITIES

6.1 Maintenance & Engineering Dept. Responsibilities (PMO Group)

- Develop and administer the program documents and the initial rollout plan,
- Develop the training packages, with the Learning & Development Dept. / others,
- Deliver the initial training to PHR Facilitators and key Participants,
- Provide advice, direction and interpretation on the program,
- Evaluate and report on the program performance, when requested by Ontario Operations management, and
- Remain current with respective legislation, Vale standards, and best practices in industry, and update the program and related guidelines and training documents accordingly.

6.2 Plant / Department Responsibilities

Each individual plant / department (including the PMO Groups) will:

- Ensure PHR Facilitators and Participants receive the required training,
- Conduct / participate in PHR’s as per this Program, the relevant PHR Guidelines, and any additional requirements of Plant / Area specific policies or procedures,
- File the completed PHR documents as per local standards,
- Audit the implementation of Action Items from PHR’s, and
- Perform local audits of PHR Program compliance.

6.3 Learning and Development Dept. Responsibilities

- Develop training / educational packages with the PMO Group / others,
- Administer the training documents, and
- Provide training upon request.

6.4 PHR Facilitators

- Issue meeting invitations to the appropriate personnel,
- Forward the relevant information before the meeting,
- Ensure the PHR process is followed as per the Guideline documents,
- Facilitate discussion – ensure hazards and appropriate control measures are identified – while keeping the meeting on track
- Distribute the completed PHR to all attendees and other stakeholders, and
- File the completed PHR as per local standards.
6.5 PHR Participants

- Review relevant material before the PHR meeting,
- Actively participate in the PHR process,
- Identify hazards and existing protection that they are aware of,
- Identify additional control measures (Actions),
- Communicate the PHR outcomes to the group(s) they represent, and
- Audit for compliance to PHR Action items, where requested by local management.

7.0 METHODOLOGY

The information presented here is an overview; refer to the Guidelines documents and the PHR Template listed in the References for specific details and step-by-step instructions.

PHR’s are done for various types of work – in each case the approach is the same:

- Pre-assess the hazards, the controls and the stakeholders
- Conduct the PHR Meeting:
  - Assemble a team of knowledgeable people
  - Review the details of the work to be done (e.g. the design or the fieldwork) and any related documentation
  - Identify the Hazards
  - Identify the Existing Protection
  - Identify the appropriate Controls
  - Document the Actions: what is required, who is responsible, and when it must be done
- Communicate the issues and control measures to those doing / managing the work
- Audit for compliance

Successful PHR’s will clearly communicate the issues and control measures to all stakeholders.

7.1 FEL Study PHR’s

Responsible:
- Project Manager / Study Manager (usually from the PMO Group)

Outcomes:
- Identify hazards & control measures while defining or eliminating options (FEL 1), evaluating options (FEL 2), and determining project scope, budgets and schedules (FEL 3). The focus includes both project execution risks and future operational or maintenance issues for the proposed equipment or processes.
- Assign Action Items. This often involves documenting hazards and controls for review in the subsequent Study and/or Detail Design step. Mitigation measures can
impact the project scope, schedule, budget or feasibility; early identification of hazards is crucial to the success of a project.

**Application:**

- PHR's are Optional for FEL 1 and FEL 2 Studies, at the discretion of the Project Manager.

  Note: a full PHR team may not be required. At a minimum, the Study Manager and/or a Subject Matter Expert should do a high-level review of the PHR Hazard Checklist, and/or review the Safety Health and Environment Checklist NAV-TP-0144.

- PHR's are Mandatory for all FEL 3 Studies and all combined FEL 1/2/3 or FEL 2/3 Studies. Follow the Navigator PHR Guideline – FEL / Construction / Commissioning NAV-GP-0072.

### 7.2 Detail Design PHR's

**Responsible:**

- PMO Group’s Plant Engineering Coordinator (PEC) – see SPEC 02001 Process Hazards Review – Design Requirements

**Outcomes:**

- Identify hazards & control measures as part of the detailed engineering effort – including new hazards introduced by the design and existing hazards related to the location / equipment / process / etc… as they relate to the design. This could include a review of the functional philosophy, process controls, interlocks, applicable standards & regulations and procedures for operations and maintenance, and/or other items.

  Note: control measures may be incorporated into the design, or may be forwarded to the other individuals (e.g. those implementing the design or those responsible for the equipment, depending on the Action required).

- Assign Action items related to the hazards and controls identified.

- Document that information for review during the resulting Construction / Maintenance activities.

**Application:**

- PHR's are Mandatory for all Detail Design packages.

- Follow the SPEC -02001 Process Hazards Review – Design Requirements

- PHR's may also be an appropriate risk management tool for other engineering-related activities.

### 7.3 Construction PHR's

**Note:** the “Construction” PHR methodology is also used for Maintenance and Operations tasks, where appropriate.

**Responsible:**
The Vale Supervisor for the Work is responsible for ensuring that the Construction PHR is completed to standard, communicated to all affected workers, and audited for compliance to PHR Action Items.

Outcomes:

- Identify all hazards associated with the fieldwork, and the required control measures.
- Assign Action items related to the hazards and controls identified.
- Document that information for review with the affected workers, supervision and management, and other stakeholders.

Application:

- PHR’s are **Mandatory** for the Construction stage of all PMO projects.
- PHR’s are **required** where triggered by an MOC Review, JHA/SSA, or other risk management tool, and **recommended** for other fieldwork involving high-risk or unusual tasks managed by Operations, Maintenance or other departments.
- Follow the Navigator PHR Guideline – FEL / Construction / Commissioning [NAV-GP-0072](#).

### 7.4 Commissioning PHR’s

Responsible:

- Commissioning Team Leader (assigned from the PMO Group, Operations, or another dept.)

Outcomes:

- Identify all hazards associated with the Commissioning activities, and the required control measures.
- Assign Action items related to the hazards and controls identified.
- Document that information for review with the Commissioning Team, workers in the area or involved with upstream or downstream processes, and other stakeholders.

**Note:** Commissioning tasks can involve a higher level of risk than Construction work or normal Operational activities in the area, due to changing conditions as equipment / processes are energized or started.

Application:

- PHR’s are **Mandatory** for the Commissioning stage of all PMO projects.
- PHR’s are **recommended** for Commissioning work involving high-risk or unusual tasks managed by Operations, Maintenance or other departments.
- Follow the Navigator PHR Guideline – FEL / Construction / Commissioning [NAV-GP-0072](#).
7.5 PHR Follow-up

All Action Items from PHR’s should be audited for implementation. The PHR template includes an (optional) Audit tab for this purpose. Consult Plant / Department management for specific audit requirements.

For Study and Design PHR’s, the follow-up audit should include:
(a) Audits of the associated documentation (Study Reports, Design packages, etc…),
(b) Field audits of the work / work site, where applicable, and
(c) Other items as appropriate.

For Construction and Commissioning PHR’s, the follow-up audit should include:
(a) Field audits of the work being done, the work site, and the required documentation (Worker Sign-off sheets, etc…),
(b) Interactive discussions with workers to ensure hazards and controls are understood and implemented, and
(c) Other items as appropriate.

8.0 RECORD KEEPING AND DATA MANAGEMENT

- All completed PHR’s must be stored in a suitable document management system as per Plant / Department standards, including all Worker Sign-Off sheets and a list of the documents reviewed as part of the PHR.
- PHR’s filed in EDOCs DM must follow the filing standards specified in DM # 689695.
- Training records for PHR Facilitators and Participants must be filed as per applicable Vale / Plant / Department standards.

9.0 COMMUNICATION AND CONSULTATION

- The JHSC Rep for the area must be invited to participate when conducting PHR’s.
- PHR documents must be reviewed by all workers at the applicable worksite(s), and hardcopy versions must be posted at the worksite.
- Action Items must be communicated to the responsible individuals as soon as possible to allow for timely implementation.

10.0 TRAINING

PHR Facilitators must receive formal training from Vale’s Learning and Development dept. or a designate from Vale’s Maintenance & Engineering Dept.

Training is also recommended for PHR participants, where practical, on a just-in-time basis. At a minimum, all participants should review the PHR Core Knowledge presentation available via the
Key Participants (e.g. those who participate in several PHR’s each year) should also be considered for in-class training (Day 1 of the Facilitator Training).

11.0 PROGRAM EVALUATION AND AUDIT

The following items will be evaluated, to identify opportunities for future improvements:

- Training materials and delivery
- Program, Guidelines and PHR template
- PHR meetings
- Overall compliance to PHR Program

The program will be evaluated at the following points:

- Rollout
  (a) Audit of PHR Training sessions to evaluate quality of materials and delivery.
  (b) Audit of PHR Meetings immediately after rollout to evaluate effectiveness of training.
  (c) Audit compliance to the Change Management Plan developed for the PHR Program.

- 6 months after Rollout
  (d) Audit program compliance: training records, invitee lists, use of standard PHR template, completion of all relevant tabs, etc…
  (e) Qualitative audit for effectiveness of PHR Meetings: quality of pre-meeting preparation; identification of hazards, controls & required actions; facilitator’s ability to get participation, manage conflict & complete meeting in allotted time.
  (f) Quantitative audit for effectiveness of PHR’s: risk assessments of PHR items before and after application of the identified PHR Actions by a subject matter expert, to determine if Residual Risk is acceptable as per Vale standards.
  (g) Field audits for completion of PHR Action items.

- 1 year after Rollout
  (h) Repeat items (d) through (g).
  (i) Program review and evaluation meeting with the stakeholder input team.
  (j) Present the evaluation findings and recommendations to the Program Owner.

- Thereafter
  (k) Perform formal / informal audits and/or program evaluations at a frequency determined by the Program Owner

- Periodically thereafter at a frequency and methodology to be determined by management, if required.
12.0 REFERENCES

The following standards apply to PHR’s for Vale’s Ontario Operations:

- **Link (CBT)**: PHR Core Knowledge Training Module
- **NAV-TP-0019**: PHR – Process Hazard Review Template
- **SPEC-02001**: Process Hazards Review – Design Requirements
- **NAV-GP-0072**: PHR Guideline – FEL / Construction / Commissioning
- **GUID-02001**: Detailed Design – Hazards and Operability Review (HAZOP) Guideline
- **NOR 0052**: Health and Safety Systemic Requirements
- **NAV-TP-0070**: Project Navigator – RACI

The following documents were prepared as part of the PHR Program development and are included only for general reference; they do not form part of the PHR Program:

- **DM # 944728**: PHR Program Change Management Plan
- **DM # 1150465**: PHR Program Evaluation and Audit Plan
- **DM # 1021061**: PHR Program Proposal (OLT Presentation)
- **DM # 1146178**: PHR Program Implementation Plan (OLT Presentation)
APPENDICES

Appendix 1 – DEFINITIONS

**PHA:** Process Hazard Analysis is a generic term for a systematic, qualitative assessment of the potential consequences of an action or activity. There are various methodologies that can be used to conduct a PHA, including but not limited to: Checklist(s), What if?/Checklist, Hazard and Operability Study, and Failure Mode and Effects Analysis. The selection of a methodology depends on a number of factors, including the complexity and/or uniqueness of the process, the level of risk, etc…. While PHA is most often associated with assessments of Health, Safety and Environment hazards in the chemical processing industry, the tools can be adapted to any task.

**HAZOP:** Hazards and Operability Studies are a structured and systematic examination of a process or operation to identify and evaluate risks to personnel or equipment, by an experienced multi-disciplinary team during a set of meetings. The technique involves studying deviations in process parameters for each node or portion of a process stream or system (or for a specific component of a piece of equipment), and the related consequences. The identified consequences can be used as the basis for further reviews, such as a PHR.

**PHR:** Process Hazards Reviews are a formal, detailed, risk assessment methodology where a multi-disciplinary team is assembled to identify hazards and existing controls associated with a defined scope of work, and the appropriate follow-up actions. Vale’s approach is loosely based on the What if?/Checklist approach.

**Constructability Review:** these are a systematic examination of the proposed construction sequence / methodology to identify potential issues or constraints and possible solutions. The approach is similar to a PHR; however, the focus is on identifying cost and schedule issues and/or the actual ability to execute the plan, and not explicitly on HSE issues.

**JHA / JSA:** Job Hazards Analysis / Job Safety Analysis is an informal risk assessment method where a small group of workers (possibly including their supervisor) reviews the hazards associated with performing an assigned task or short series of tasks, and the required control measures, based on a written job procedure or methodology.

**SLAM:** See-Look-Assess-Manage is an informal, field-level risk assessment done by an individual worker relating to the hazards of their workplace and the assigned work, with a particular focus on identifying unusual and/or non-routine tasks and the appropriate follow-up.

**PHR Facilitator:** the Facilitator’s primary function is to ensure that the PHR is done in a systematic and organized fashion as per the program standards and that the desired outcomes of the review are achieved in the most efficient manner. Ideally, they will also understand the work and the associated hazards and controls. At times, the Facilitator will not have this detailed knowledge – making it even more important to assemble a well-qualified multi-disciplinary team with access to all of the required expertise and information.
14.0 REVISIONS

Revision history:

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<td>1st Draft</td>
<td>All – development for stakeholder input</td>
<td>T. Hirschfeld</td>
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<td>All – for initial review with management</td>
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<td>Section 2.0 included verbiage that the JHSC Rep to be officially notified of or attend Construction / Design PHR and notification to be filed as per PDR regulations.</td>
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<td>2014/02/12</td>
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<td>Section 4.1 paragraph 4 updated to clarify the use of field level risk assessment tools. Section 4.1 a) updated for clarity Section 6.0 – clarification added</td>
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<td>6</td>
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<td>TP</td>
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<td>2015/06/05</td>
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<td>2015/11/15</td>
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<td>Section 8.2 Attendees – added paragraph 3 regarding Subcontractor attendance at PHR Meetings</td>
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Table of Contents

1.0 CONTEXT .................................................................................................................... 3
2.0 PURPOSE .................................................................................................................... 3
3.0 REFERENCE DOCUMENTATION .............................................................................. 3
4.0 FEL STAGE PHR'S .................................................................................................... 4
  4.1 GENERAL .................................................................................................................... 4
  4.2 FEL 1 STUDY PHR GUIDELINE .................................................................................. 4
  4.3 FEL 2 STUDY PHR GUIDELINE .................................................................................. 5
  4.4 FEL 3 STUDY PHR GUIDELINE .................................................................................. 5
5.0 CONSTRUCTION PHR'S ............................................................................................. 6
  5.1 GENERAL .................................................................................................................... 6
  5.2 PMO PROJECT WORK ............................................................................................... 6
  5.3 MAINTENANCE AND OPERATIONS WORK .............................................................. 6
  5.4 CMO CONTINUOUS SERVICE CONTRACTS ............................................................. 7
  5.5 FIELD ENGINEERING WORK .................................................................................... 7
  5.6 CHANGES DURING THE WORK ................................................................................ 7
6.0 COMMISSIONING PHR'S ............................................................................................ 8
  6.1 GENERAL .................................................................................................................... 8
7.0 PREPARATION FOR THE PHR MEETING ................................................................. 8
  7.1 THE PHR FACILITATOR ............................................................................................. 8
  7.2 PHR MEETING INVITATIONS ..................................................................................... 9
8.0 USE OF THE PHR TEMPLATE (NAV-TP-0019) ........................................................ 10
  8.1 PHR TYPE TAB ......................................................................................................... 10
  8.2 ATTENDEES TAB ...................................................................................................... 11
  8.3 PHR PREPARATION CHECKLIST TAB ...................................................................... 11
  8.4 METHODOLOGY TAB ............................................................................................... 11
  8.5 HAZARDS CHECKLIST TAB ...................................................................................... 12
  8.6 HAZARDS TRIGGERS TAB ....................................................................................... 12
  8.7 MINUTES TAB ........................................................................................................... 12
  8.8 WORKERS SIGN OFF SHEET ................................................................................... 14
  8.9 HAZOP TAB (Optional) ............................................................................................ 14
  8.10 PHR AUDIT TAB (Optional) ................................................................................... 15
9.0 TYPICAL PHR MEETING AGENDA .......................................................................... 15
1.0 CONTEXT

The Vale Ontario Operations PHR Program document specifies the policy and the requirements for all Process Hazards Reviews. It also provides definitions, roles and responsibilities, training requirements, and other essential information.

As per the PHR Program, PHR’s must be conducted for all PMO projects at the FEL Study Stages, Detailed Design, Construction and Commissioning stages. The PHR reviews at each project stage focus on different aspects, but the intent and the approach are consistent.

PHR’s should also be conducted for other activities where merited, e.g. Operations or Maintenance work that poses significant or unusual hazards.

2.0 PURPOSE

The purpose of a PHR is to identify and assess the hazards associated with the work to be done, and determine the required control measures.

This guideline describes best practices specific to Construction PHR’s.

This guideline also applies to PHR’s done for Operations / Maintenance work.

3.0 REFERENCE DOCUMENTATION

The following documents were used in the development of this document or are related to it. The most recent revision shall be used. Also refer to the Project Navigator Toolkit documents.

Link PHR Program – Ontario Operations
Link PHR Core Competency Training Module
SPEC-02001 Process Hazards Review – Design Requirements
NAV-TP-0019 PHR – Process Hazard Review Template
NOR 0052 Health and Safety Systemic Requirements
NAV-TP-0070 Project Navigator – RACI
NAV-GP-0075 Pre-development Review Guideline
4.0 FEL STAGE PHR’S

4.1 GENERAL

Process Hazards Reviews are conducted at the FEL 3, Detail Design, Construction and Commissioning stages. High level PHR reviews may also be conducted at the FEL 1 and FEL 2 stages. The focus is on business risks and/or Safety/Health/Environment risks for the operation, and impacts to the public. Additional PHR’s may be required to evaluate new or revised portions of the project that could significantly change those impacts.

If additional hazards are identified during the study the PHR must be revised and distributed to all original PHR meeting participants.

All personnel performing field work activities related to Engineering design and / or FEL Studies (e.g. field measurements, soils investigation, General Review of Construction, etc…) must do a Construction PHR, or review the existing PHR documents related to the work.

PHR’s for FEL Studies should be performed when the study is approximately 85% complete.

For studies that include engineering deliverables, the PHR should be done as part of the 85% Design Review.

The FEL Study Report should incorporate all recommendations from the FEL Stage PHR.

4.2 FEL 1 STUDY PHR GUIDELINE

The FEL 1 Study stage identifies the problem and the desired end state / deliverables. The FEL 1 Study also defines the options to be explored during the FEL 2 stage. The PHR process assists in the selection of the options. The FEL 1 PHR identifies any risks associated with that project, identifies any new processes and hazardous materials that may be potentially involved, and assesses those risks. This assessment may identify changes to the proposed project scope / deliverables required at FEL 1, and should be used as information for the FEL 2 Study development and subsequent PHR’s.
4.3 FEL 2 STUDY PHR GUIDELINE

The FEL 2 Study stage evaluates all suitable options. The FEL 2 PHR considers the operational implications of each option and provides input to management’s decision regarding a preferred option. The FEL 1 PHR should be reviewed, if applicable. New risks such as equipment, processes, personnel, etc should be identified. This assessment may identify changes to one or more of the proposed options being assessed at FEL 2, and should be used as information for the FEL 3 Study development and subsequent PHR’s.

4.4 FEL 3 STUDY PHR GUIDELINE

The FEL 3 Study stage develops the recommended option. The FEL 3 PHR considers the future operational and maintenance implications of the project, as part of the risk assessment for the preferred option. The FEL 1 and FEL 2 Study PHR’s should be reviewed, if applicable. Any hazards identified during the FEL 3 PHR should be noted as requiring review during the Detail Design and / or Execution phase of the project. All costs associated with addressing and controlling the hazards must be considered and included within the FEL 3 budget estimate.

FEL 3 PHR’s should include a review of functional requirements / specifications for major equipment and process controls etc, and a high level review of the proposed construction methodology.
5.0 CONSTRUCTION PHR’S

5.1 GENERAL

The focus of a Construction PHR is on the risks to the people doing the work, and others in the area. Significant impacts to the operating equipment, the public or the environment caused by the construction activities will also be examined.

For specific tasks where the exact scope and/or work methodology can’t be identified in advance, or where the hazards are unusual, another approved field level risk assessment techniques such as SLAM, or Job Hazard Analysis (JHA) should be used to address the specific hazards of these tasks. This may be done instead of a PHR, or in conjunction with the PHR for the overall job.

5.2 PMO PROJECT WORK

One or more Construction PHR’s are required for each contract and/or Work Package on PMO Projects. A Construction PHR must be done before doing any fieldwork, including mobilization of equipment or materials. Major work packages that involve many tasks or several different construction trades may require several separate Construction PHR’s to adequately assess all of the hazards and identify / develop control measures for each. Specialty work may require a task-specific Construction PHR and/or a JHA. These should focus on actions of people, keeping in mind how they will actually do the work. Contract-specific Safety Plans for the project should incorporate Actions from the Construction PHR where appropriate (e.g. specific Audits, etc…).

5.3 MAINTENANCE AND OPERATIONS WORK

Maintenance or Operations work of a non-routine / hazardous nature requires some form of risk management. The Construction PHR methodology and template provides a method for identifying hazards & the required controls, and a means of documenting and communicating that information. This applies whether the work is being done by Vale personnel, contracted to external service providers, or a combination of personnel. In some circumstances, another risk management tool may be more appropriate. If the work is similar in scale / complexity / duration to a “typical” PMO contract, the Construction PHR approach will generally be a good choice.
5.4 CMO CONTINUOUS SERVICE CONTRACTS

For Services type contracts, a Construction PHR should be done during the contract kickoff. The intent of this PHR is to review the hazards generally associated with the type(s) of field work activities included in the contract, and the required mitigation measures for those hazards. For abnormal / unusual tasks a JHA or other field level risk management tool may be appropriate to address the specific hazards of these tasks.

5.5 FIELD ENGINEERING WORK

All personnel on PMO Projects that are performing field work activities related to Engineering design and / or FEL Studies (e.g. field measurements, soils investigation, General Review of Construction, etc…) must do a Construction PHR, or review the existing Construction PHR documents related to the work.

5.6 CHANGES DURING THE WORK

If the scope of work changes, or if additional hazards are identified during the work the PHR must be updated with the original PHR meeting participants or an appropriate field level risk assessment must be completed with the appropriate personnel. The new information must be reviewed with all affected workers.
6.0 COMMISSIONING PHR’S

6.1 GENERAL

A Commissioning PHR must be done before doing any commissioning activities for the project. The focus of this PHR is on the risks to the people doing the work, and others in the area. Significant impacts to the operating equipment, the public or the environment caused by the commissioning activities will also be examined.

One or more Commissioning PHR’s are required for each major piece of equipment or process system being commissioned. Major projects / work packages that involve many tasks or several different construction trades may require several separate Commissioning PHR’s to adequately assess all of the hazards and identify / develop control measures for each. Specialty work may require a task-specific Commissioning PHR. These should focus on actions of people, keeping in mind how they actually have to do the work.

If additional hazards are identified during the work the PHR must be revised and distributed to all original PHR meeting participants. All affected workers must review and sign off the revised PHR.

Commissioning PHR’s should be very specific as to the controls that are to be put into place.

Where applicable, the Commissioning Plan / Manual should incorporate all recommendations from the Commissioning PHR.

7.0 PREPARATION FOR THE PHR MEETING

7.1 THE PHR FACILITATOR

The Vale Superintendent responsible for the work (PMO Project Manager, or Operations / Maintenance Superintendent, or CMO Superintendent) will assign the PHR Facilitator.

The PHR Facilitator’s role is to ensure that the PHR process is followed as per the Standard and this guideline, and that the relevant hazards and controls are documented in a manner that can be readily communicated to the affected workers.

The PHR Facilitator is responsible for issuing the meeting invitations, pre-screening the Hazards tabs, recording and publishing the Minutes and associated information, following the guidelines below. Although they may delegate some or all of these tasks to others, they remain responsible for the process and the quality of the finished PHR.
Note: the PHR Facilitator must attend formal in-class PHR training from Vale Learning & Development.

Ideally, the Facilitator is also aware of the hazards associated with the work activities and the workplace, along with the required controls. This is not mandatory; however, because the PHR team will include others with that information.

7.2 PHR MEETING INVITATIONS

The Facilitator will review any relevant documents prior to organizing the PHR meeting, to identify Action Items that need to be addressed, and to develop a list of potential hazards.

Invitations to PHR meetings should be issued at least one week before the meeting, to ensure those invited can attend. Exceptions would include emergency work and similar circumstances. Note that SME’s, OEM Technical Reps and others may require more than one week’s notice.

Meeting invitations are to include the following documents for review by participants, where applicable.

FEL Stage PHRs:

a) Previous PHR’s, SHE Reviews and other Risk Assessment documents
b) The Project Stage Initiation Request
c) The Project Charter and Execution Plan

Construction Stage PHRs:

a) Previous PHR’s, SHE Reviews for this or similar work
b) The Scope of Work package and related documents
c) The sequence of construction tasks and/or the schedule for the work
d) A description of the equipment and process / procedures to be used

Commissioning Stage PHRs:

a) Previous Commissioning PHR’s for this or similar work
b) the Scope(s) of the Work related to the items being commissioned
c) The Commissioning Checklist / Plan / Manual
d) the sequence of commissioning tasks

e) a description of the equipment and processes / procedures to be used

A site tour should be conducted with all PHR Invitees prior to the formal meeting, where appropriate.

A Safety, Health and Environment Checklist should be completed for the work. If any question on the Checklist is answered “yes, the representatives from the appropriate department(s) must attend the meeting and/or review the Minutes and provide feedback.

8.0 USE OF THE PHR TEMPLATE (NAV-TP-0019)

The current version of the standard Vale PHR template must be used for all PHRs.

The template includes several tabs – all tabs must be completed in sequence from left to right. Note that the tabs labeled HAZOP and PHR Audit are optional, all other tabs must be filled out.

The template includes internal links between tabs that reduce data-entry effort; the entire workbook must be kept together for those to function.

- Any information filled out on the header section of any tab will auto-populate to all of the other tabs that include that data.
- Actions listed in the Minutes tab will be included on the PHR Audit tab.

8.1 PHR TYPE TAB

Select the appropriate PHR Stage - this will streamline the attendees list on the Attendees tab, and will auto-populate the Project Stage in the header section of several tabs.
8.2 ATTENDEES TAB

The Vale Facilitator will review the list of potential attendees from the Attendees tab in the PHR template, and invite the appropriate personnel.

Representatives from the group managing the work (PMO or Plant) and from the Work Group(s) doing the work must participate in all PHR’s associated with the work.

Subcontractors that are materially involved in the work or that can contribute to the identification of hazards and controls should attend the PHR meeting. They can be invited to the initial PHR meeting, or a separate PHR meeting for their work. Note that the interaction between work groups may sometimes create unique hazards that require representatives from all groups to participate in a single PHR meeting.

Descriptions are provided for the terms: “Attend”, “Attend/Review”, “Be Considered”, and “Invited”. These descriptions are aligned with the PHR Program document and the related guidelines.

8.3 PHR PREPARATION CHECKLIST TAB

The PHR Facilitator will review and complete this Checklist before the PHR meeting, to ensure the required preparatory work has been completed.

This includes reviewing previous Action Items that need to be addressed, reviewing the documents issued with the meeting invitation (see section 7.2), and pre-screening the Hazards Checklist and Hazards Triggers tabs to identify potential hazards and controls.

These details must also be reviewed with the PHR team before assessing the hazards. It is crucial that the participants understand the scope and the execution plan for the work being done. Photos, Plot-plan or General Arrangement drawings and P&ID’s are useful aids. Full-size versions and/or electronic copies should be available for display during the meeting.

A site tour should be conducted with all PHR Invitees prior to the formal meeting, where appropriate.

8.4 METHODOLOGY TAB

The Overview of Scope should describe what the job entails and its boundaries. Include sufficient detail to assess the hazards associated with the work. Expand on this at the meeting as needed.
Example: *Installation of ISA Mill foundation.*

Under **Methodology** for a Construction or Commissioning PHR, list the job steps / commissioning tasks in the sequence they will be done, including major equipment, tie-ins, and any unusual hazardous materials.

Construction Methodology Example:

- *Mobilize and establish laydown areas for the job.*
- *Saw cut concrete at perimeter.*
- *Break and remove concrete elevated slab at elevation.*
- *Layout & install rebar and formwork for ISA Mill foundation*

Under the **New Processes or Materials** for FEL PHRs list major equipment, process changes, tie-ins and working environment changes, and new Hazardous Materials.

Attach all relevant documentation e.g. flowsheets, general arrangements, drawings, Scope of Work, and P&ID’s relating to the PHR.

8.5 **HAZARDS CHECKLIST TAB**

The Hazards Checklist is used to quickly identify hazard topics for review and discussion. It should be pre-screened beforehand and then discussed briefly at the meeting.

8.6 **HAZARDS TRIGGERS TAB**

The Hazards Triggers list is used to pre-screen for potential hazards and controls before the meeting – check off or highlight each line that may apply. This pre-screened trigger list is then used to prompt discussions during the PHR meeting.

8.7 **MINUTES TAB**

This tab is used to document the meeting discussions and to record the assignment of action items.

Using What If questions, list events that could cause a hazardous condition or undesired event to occur, and what the result might be (i.e. Injury/damage, etc...). Ensure that the What If statements are specific and completely describe the associated Hazard. (Do not use single word What If statements.) List all of the What
If statements (the possible events) for the first Hazard, then move on to the next Hazard, and so on, until the PHR is completed and agreed to by those in attendance.

For each of the potential hazards listed, describe the Existing Protection in place that will mitigate the hazard and lower the risk. Where appropriate, the Existing Protection should refer to legislation, SPI’s/policies/procedures/programs, Engineering packages (drawings, scope of work, specifications, etc…) or other documents that govern the work. These may be Vale documents, or may come from a contractor or consultant.

Construction PHR Example:

- “Vale Working at Height Rescue Plan Work Sheet to be used as per Vale SPI-06 for Fall Protection.” is preferable to “WAH Rescue Plan.”

List Actions that will further help mitigate the hazards and lower the risk, to help ensure everyone gets HomeSafe.

Use the “Hierarchy of Controls” model to generate possibilities.

All PHR Actions must be true action statements that can be readily audited.

Construction PHR Example:

- “the crew Supervisor will audit for compliance to standard ABC and complete audit form 123” is preferable to “comply with standard ABC.”

In the Action By column, assign the person / role responsible (c/w the company name) for follow-up and mark the Status of the item as complete or incomplete. PHR action items may be assigned to Vale personnel or to the contractor / consultant; both parties are ultimately accountable for mitigation of the hazards identified.

Construction PHR Example:

- “John Smith, Vale” or “Jane Jones, ABC Contracting Inc.”, or “Safety Coordinator, XYZ Consultants, Ltd”.
In the Review With … column, indicate the group(s) that need the information. The “Entry By Record View” button displays only a single row on screen, this may be a more effective way to produce or edit the PHR Minutes line items.

Using the “Print By Review Group” button allows you to print only the items that the Workers must review and sign off, for example.

8.8 WORKERS SIGN OFF SHEET

The Workers Sign Off Sheet is not applicable for FEL PHRs. Construction PHR’s must be reviewed with every worker assigned to the related tasks, before they start that work. Signatures are to be obtained to document those reviews. The Work Plan and Safety Plan should be included.

8.9 HAZOP TAB (OPTIONAL)

Hazards and Operability Studies are another method of identifying risks to personnel or equipment, by reviewing the possible deviations in process parameters for each part of a process stream or system, and identifying the related consequences. When a significant process change is being made that involves large or complex systems, the review may be lengthy and personnel specifically trained in HAZOP analysis should lead it.

For smaller process changes, or for a review of Construction / Maintenance work with some potential impacts on the process, the optional HAZOP Considerations tab in the PHR template can serve as a simple means of listing the Node, Process Parameter, Deviation and Consequence.

Construction PHR Example:

- “Discharge line from Pump #23-A … Pressure … Increase … Pressure Safety Valve will relieve to atmosphere.”

The identified consequence can be copied to the PHR Minutes tab as a “What if …” statement, and the associated hazards and controls can be identified.

The same technique can be used for a specific component of a piece of equipment.

Construction PHR Example:

- “Motor from Blower #5 … Starting Current … Increase … Motor will trip due to synchronization failure.”
8.10 PHR AUDIT TAB (OPTIONAL)

All PHR Actions should be audited for completion; use of this tab is optional.

PHR Actions listed in the **Minutes** tab are automatically copied over to the PHR Audit tab, providing a simple way to produce the audit document.

9.0 TYPICAL PHR MEETING AGENDA

Review the project background, the scope of work and battery limits, and the associated documentation (refer to section 7.2) to ensure that all attendees understand the work and execution methodology.

Discuss any Actions from related Process Hazard Reviews etc…, if applicable, to ensure that any identified hazards have been addressed.

Briefly review the Hazard Checklist to identify hazard categories.

Provide printed copies of the pre-screened Hazard Triggers list to all attendees.

For each item on the Hazard Triggers list, decide as a group whether the hazard applies to the work. If so, define the “What If …” statement that best describes the Hazard, and determine the Existing Protection and the required Actions, if any.

- Copying the identified hazards from the Triggers list to the Minutes tab before the meeting and identifying the Existing Protection will speed up the meeting.

- Focus on the most significant hazards; those with the highest consequences, highest frequency, or both.

- There are many triggers on the list – keep the discussion of each to the minimum time required to identify the hazards, existing protection, and actions needed.

- If the Existing Protection effectively reduces the Hazard to an acceptable level, no Action item is required.

Record the discussions on the Minutes and assign a person accountable for further action in eliminating or managing the hazard.

- Recording the minutes “live” on screen during the meeting will usually generate more discussion, and Hazards and potential controls will be identified that may not have been otherwise.

- This requires a scribe with the confidence and ability to type in front a group. The PHR Facilitator usually won’t be able to do both jobs at once.
Before concluding the meeting:

- Ask each attendee if they have any outstanding areas of concern related to the PHR. Document any relevant items in the Minutes.

- Ensure all attendees are clear on the next steps:
  - Whether further reviews must be done by those that could not attend the meeting.
  - Who will finalize and forward the PHR Minutes file to the attendees and to other stakeholders, and by when.
  - Who will review the PHR with the affected workers, before they start the work (or particular parts of the work, such as mobilization).
<table>
<thead>
<tr>
<th>Rev</th>
<th>Description</th>
<th>Rev’n by</th>
<th>App Sud</th>
<th>App PC</th>
<th>App Thom</th>
<th>App VB</th>
<th>App LH</th>
<th>App Clyd</th>
<th>App Act</th>
<th>Issue Date YYYY/MM/DD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1st Issue</td>
<td>AD 2015/12/08</td>
<td>CM 2015/12/08</td>
<td>Pending</td>
<td>Pending</td>
<td>Pending</td>
<td>Pending</td>
<td>Pending</td>
<td>Pending</td>
<td>2015/12/08</td>
</tr>
</tbody>
</table>

Sud = Sudbury, Ontario, PC = Port Colborne, Thom = Thompson, Manitoba, VB = Voisey’s Bay, LH = Long Harbour, Act = Acton, England, Clyd = Clydach, Wales, N/A = Not Applicable
1.0 PURPOSE

This guideline describes best practices for conducting a Hazards and Operability (HAZOP) review at the Detailed Design stage of a project.

Note: This is the BASIC methodology for conducting Hazards and Operability (HAZOP) review for small engineering jobs. Larger jobs may require a more detailed review.

2.0 APPLICATION

This guideline applies at any Vale locations indicated with approval on the cover page with the following exceptions:

None

3.0 REFERENCE DOCUMENTATION

The following documents are related to this guideline:

SPEC-02001 Design Process Hazards Review Requirements

4.0 GENERAL

Depending on the nature of the job, in addition to the Process Hazards Review, it may be necessary to conduct a Hazard and Operability (HAZOP) review.

As a guideline, a HAZOP is usually required if a job involves changes or additions to the Flowsheet, or a change to the process and is conducted as part of the design.

The Hazards Analysis Review is attended by the Design Team, Process Tech and Operations.

5.0 PROCESS

During a HAZOP review, each pipe line, vessel, piece of equipment, etc., is reviewed from a point of view of a non-normal process condition. For example, what are the consequences of pressure building in a plugged pipeline?

Hazard Analysis Steps

- Select Node (line or vessel)
- Understand design intent
  - Select Parameter (Examples: Pressure, Flow, Temp, etc)
Consider deviation (example: over-pressure)
- Determine consequences
- Identify cause(s) of deviation
- Establish plan in design to reduce/eliminate the risk

- Next Parameter (example: under-pressure)

### Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>More</th>
<th>Less</th>
<th>None</th>
<th>Reverse</th>
<th>Part of</th>
<th>As well as</th>
<th>Other than</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow</td>
<td>High Flow</td>
<td>Low Flow</td>
<td>No Flow</td>
<td>Backflow</td>
<td>Wrong Concentrations</td>
<td>Contaminants</td>
<td>Wrong Material</td>
</tr>
<tr>
<td>Temperature</td>
<td>High</td>
<td>Low</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pressure</td>
<td>High</td>
<td>Low</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level</td>
<td>High</td>
<td>Low</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td>Too long, too Late</td>
<td>Too short, too soon</td>
<td>Miss a step</td>
<td>Steps backwards</td>
<td>Action missed</td>
<td>Extra Action initialized</td>
<td>Wrong time</td>
</tr>
</tbody>
</table>

Example:
- Design Intent – Batch gravity transfer of slurry from A to B
- Node - Gravity Slurry Line
- Parameter – Flow
  - Deviation – Low Flow
  - Consequence
    - Solids settle out
    - line plugs
  - Cause
    - Pipe too large (low velocity)
    - Valve not fully opened
    - Inadequate slope in pipe
  - Plan
    - Install limit switch on valve to indicate fully open
    - Proper size of pipe
    - Pipe adequately sloped
    - Add flush water
APPENDICES

Appendix A: Revision and Transition Notes
Appendix A: Revision and Transition Notes

(Revisions are listed in reverse chronological order with most recent revision at the top. Revision notes describe: what was changed, why it was changed, and the plan to implement the change, including whether changes are retroactive)

Note: The revision notes are a summary of the changes and may not necessarily be a complete list.

Revision 1
New Document - 1st Issue
1.0 PURPOSE

This specification describes the minimum requirements for Process Hazards Reviews at the design stage (Design PHRs).

2.0 REFERENCE DOCUMENTATION

The following documents are related to this specification:

- PHR Program
- GUID-02001 Hazard & Operability Review (HAZOP) Guideline
- NAV-TP-0019 Process Hazards Review - Template
- NAV-GP-0071 FEL Stage PHR Guideline (Review)

3.0 GENERAL

It is Vale's policy to provide employees with a safe workplace, to safeguard company property and to conduct operations in a manner not hazardous to the public or the environment, through Vale's PHR Program.

The elimination and control of process hazards is an on-going task throughout the design process. Hazards should be discussed at the assessment meeting and at the 30% design review with the goal of eliminating the hazard where possible as part of design. To ensure that all hazards have been considered/addressed, a formal PHR is conducted at approximately the 85% design completion stage for all FEL 3 and Detail Design jobs.

On a project by project basis, the Project Manager/Study Manager will determine if a PHR at the FEL1 or FEL 2 stage is required. This is done by reviewing the hazard checklist at a high level to determine if a PHR is warranted. In general, a simple project that is not introducing new technologies or methodologies probably doesn't need a PHR during the concept or prefeasibility stages. In other cases, a PHR may identify issues or requirements that could affect the project scope, budget & feasibility for the various options.

Where computer based logic systems are involved, a Design Process Hazards Review shall be completed to consider any hazards that may exist once the logic system is operating as designed. A Commissioning Process Hazards Review shall also be completed to consider any hazards that may be present while installing, programming or commissioning the system as designed.

The What-If/Checklist technique of analysis is used for Process Hazards Reviews but may be supplemented by other techniques as required. The objective of using this technique is to conduct a systematic and comprehensive review of potentially hazardous processes and equipment.
Note: Depending on the nature of the job, in addition to the Process Hazards Review, it may be necessary to conduct a Hazard and Operability review. (HAZOP)

A HAZOP is usually required if a job involves changes or additions to the Flowsheet, or a change to the process, and is conducted as part of the design. See guideline GUID-02001.

Significant design changes during construction or commissioning may require a review of the Design PHR, or the conducting of an additional PHR if necessary.

### 4.0 PHR FACILITATOR

All PHRs at Vale must be facilitated by a person that has been trained as a PHR facilitator, through the Vale PHR Program.

For design PHRs (FEL or Detail), the facilitator is normally the PEC, however the PHR meeting tasks are shared between the PMO PEC and the Engineering Design Team Lead.

The Design Team Lead (or designate) is responsible to:
- Forward any relevant information to the PEC before the meeting,
- Lead the Technical discussions at the meeting including a technical overview of the job,
- Record the meeting minutes,
- Distribute the PHR minutes to all attendees
- Address any design related action items,
- Issue the design PHR minutes with the design package,

The PMO PEC is responsible to:
- Issue meeting invitations to the appropriate personnel,
- Ensure the PHR process is followed as per the Guideline Documents,
- Facilitate discussion – ensure hazards and appropriate control measures are identified – while keeping the meeting on track
- Forward the PHR minutes to other stakeholders as required,
- File the completed PHR as per local standards

### 5.0 PHR PARTICIPANTS

Design PHR participant requirements are outlined on the “Attendees” tab within the PHR template. Generally, for Design PHRs (FEL or Detail), it is recommended that at a minimum, attendees should include the DTL, the PEC, and plant representation for operations and maintenance.

If people from the “Attend/Review” list are not available for the PHR meeting, the available team should be reviewed by the PEC and DTL, to determine if there is adequate attendance for the PHR to proceed.
6.0 THE DESIGN PHR MEETING

The design team lead will provide an overview of the job, outlining the functional philosophy and the scope of the work by presenting any available drawing layouts, 3D PDF, etc., so that all participants are familiar with the job going into the PHR discussions. The design team will also provide technical support as required during the meeting.

The PHR team must review any PHR reports from any previous stages, if applicable, to ensure that any action items/hazards that were identified at those stages have been addressed during the current design stage.

The design team (DTL or designate) will record the discussions and recap the action items at the end of the meeting. The DTL will distribute the meeting minutes to the PHR participants within 2 days of the meeting.

The standard template for recording the PHR is NAV-TP-0019. The template is in Excel and has multiple tabs. The following tabs are used for Design PHRs.

**PHR Type**
- This tab is used to automatically customize the template based on the PHR Type selection.

**Attendees**
- This tab provides guidance to identify who needs to be invited to the meeting, and identifies the minimum attendee requirements. The tab is custom, based on the selected stage from the PHR Type tab. At the meeting it can also be used as an attendance sheet.

**Methodology Tab**
- For the Design PHR, the methodology tab is used to document a brief summary of the scope, and to list any documents that were used as the basis of the PHR meeting. The methodology section is used to list any new processes or materials being introduced with the project.

**Design Hazards Checklist Tab**
- Each hazard topic on the General Hazards Checklist is discussed one by one, using the Design PHR Trigger Tab that includes triggers that provide guidance and can prompt discussions.

**PHR Minutes Tab**
- This tab is used to document the discussions of the meeting and to record the assignment of further actions required.

In filling out the meeting minutes, “Existing Protection” includes “what has already been included in the design”.
Any action items are assigned during the meeting and recorded. They must be clearly stated as to what the action required is, and who is responsible (the person) for completing the action item.

Action items are always assigned to someone in attendance at the meeting. If there is action required by someone that is not in attendance, an attendee is assigned to contact that person, as the action item.

Action items assigned to the design team must be addressed prior to issuing of the detailed design package.

**HAZOP Tab**
If deemed that a HAZOP review is necessary, the HAZOP tab may be used to record consequences that should be discussed as part of the Design PHR.

**PHR Audit Tab**
This tab is automatically populated based on information entered on the PHR Minutes tab. It may be used as a checklist to follow-up the status on action items.

**Workers Sign-off Sheet Tab**
This tab is **not used** for Design stage PHR’s

Once the PHR meeting minutes are distributed, attendees should review the minutes and feedback any discrepancies to the originator and/or PEC as soon as possible. Acceptance of the PHR minutes is assumed if no feedback is received.

### 7.0 APPENDICES

Appendix A: Revision and Transition Notes
## Appendix A: Revision and Transition Notes

Revision notes describe: what was changed, why it was changed, and the plan to implement the change, including whether changes are retroactive.

<table>
<thead>
<tr>
<th>Rev</th>
<th>Description</th>
<th>Revision by</th>
<th>Approved by</th>
<th>Issue Date YYYY/MM/DD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Document format and number changed due to Vale Engineering Document Program changes in 2011. Previous standard number was 0200-03.01.011 Rev 4. Changes have also been made to align with updated documentation developed for the Project Navigator system.</td>
<td>AD 2012/08/15</td>
<td>IG 2012/08/15</td>
<td>2012/08/15</td>
</tr>
<tr>
<td>2</td>
<td>Areas of responsibility revised. Engineering will now be responsible for recording the minutes at the Design Process Hazards review only, and to provide Technical support, at all other stages, where applicable. Document has also had a general revision for clarity.</td>
<td>AD 2012/08/28</td>
<td>IG 2012/08/28</td>
<td>2012/08/28</td>
</tr>
<tr>
<td>3</td>
<td>Guidance around determining when a PHR is required for FEL1 and FEL2 stages of a project.</td>
<td>AD 2013/02/12</td>
<td>TR 2013/02/12</td>
<td>2013/02/12</td>
</tr>
<tr>
<td>4</td>
<td>To align with Vale’s PHR Program, this document now addresses “Design” PHRs only. Other PHRs at different stages (construction and commissioning will now be covered in other documents)</td>
<td>AD 2015/12/08</td>
<td>CM 2015/12/08</td>
<td>2015/12/08</td>
</tr>
<tr>
<td>5</td>
<td>PHR Facilitator task responsibilities clarified. Document format changed.</td>
<td>A.Delost</td>
<td>C.Marshall</td>
<td>2016/05/10</td>
</tr>
</tbody>
</table>
The main tabs on the PHR Template are:

- Attendees
- Methodology
- Hazard Checklist
- PHR Meeting Minutes
- Worker Sign-off

The other tabs are **Optional**, so we’ll spend less time on them.

**For each of the main tabs, we’ll review:**

- What’s important on each tab
- How to pre-populate it before the meeting
- How to complete it during the meeting
- What to do with it after the meeting

**The next section of your books includes some reference material:**
1. PHR Type
2. Preparation Checklist
3. PHR Attendees
4. Methodology
5. Hazards Checklist
6. Hazard Triggers
7. PHR Meeting Minutes
8. Worker Sign Off
9. HAZOP Considerations
10. Field Audit (PHR Follow-up)
PHR Meeting Roles

**Facilitator:** A Vale Representative responsible for the PHR. Initiates PHR Meeting to appropriate personnel, forwards all relevant information, ensures the PHR process is followed, facilitates discussion, ensures hazards and appropriate control measures are identified, files and distributes completed PHR.

**Participant:** Reviews relevant material and actively participates in PHR process to identify hazards and possible control measure. Communicates PHR outcomes to the group(s) they represent.

**Scribe:** An individual requested / assigned by the Facilitator to take the minutes of a PHR who will send the final file to the Facilitator for review and distribution.
Current Template

– If you can’t find the current Template, contact your Vale Rep

PHR Type

– Most of the PHR’s done with contractors will be Construction or Commissioning
– Eng’g Consultants may also be involved with Design PHR’s and FEL Study PHR’s
– The basic PHR Process that we just reviewed is the same for all types
  • A few details are changed for Design & Study PHR’s
PHR Template

** Always use the current Template **  (NAV-TP-0019 +)

- The template is updated periodically to
  - Improve the PHR process
  - Make the template easier to use
- Available on the PMO Extranet site: http://extportal.vale.com/PMO

PHR Type

- First tab
- Selecting a Type of PHR …
  - Pre-fills some fields
  - Hides or Displays certain tabs
<table>
<thead>
<tr>
<th><strong>Project Title:</strong> (enter Project Title / desc of work for non-project work)</th>
<th><strong>Project #:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Plant Name:</strong></td>
<td><strong>Oracle Plant #::</strong></td>
</tr>
<tr>
<td><strong>PHR Type:</strong></td>
<td><strong>Date:</strong></td>
</tr>
<tr>
<td><strong>PHR Facilitator:</strong></td>
<td><strong>Document DM#:</strong></td>
</tr>
<tr>
<td><strong>Contractor / Consultant / Work Group:</strong></td>
<td><strong>Rev #:</strong></td>
</tr>
</tbody>
</table>

---

**PHR Preparation**

- Vale Rep to review Pre-Mobilization Checklist with Contractor Representative(s)
- PHR Meeting Attendees identified as per the PHR Attendees tab
- Vale Rep to obtain copies of and either reference or attach to PHR Methodology tab: SHE Review, FEL/Design PHR, Constructability Review, Scope of Work, Contract Requirements, Drawings, P&ID's, WAH Risk Assessment, Contract Specific Safety Plan, previous PHRs for the work, Commissioning Documents, Maintenance Planning package, etc...
- Vale Rep to review Design PHR to bring forward any construction hazards identified during Design PHR to Construction PHR (or Construction PHR to Commissioning PHR)
- Sequence of work tasks or the description of equipment / process completed on PHR Methodology tab
- Meeting Invitation issued by Vale Rep (with supporting documents)
- Vale Rep to confirm all required attendees have accepted
- Vale Rep to ensure all invitees are familiar with the work site (if req'd, arrange site visit as part of the PHR Meeting)
- PHR Facilitator has been identified
- Scribe (minutes taker) has been identified
- If there will be commissioning requirements, Vale Rep to initiate a separate Commissioning PHR Meeting

**PHR Template Check**

- All PHR heading information is completed and correct
- All supporting documents are attached or referenced on the Methodology tab
- An overview of the scope has been entered on the Methodology tab
- A Methodology or List of Processes/Materials has been entered on the Methodology tab
- The Hazards Checklist has been reviewed and the appropriate hazard classes have been marked with an "X"
- The EVENTs listed are clear "What If" statements
The Preparation Checklist is Optional

- If you use it and have any suggestions for improvement, contact Trueman Hirschfeld
PHR Template

Preparation Checklist

– Optional tab

– Covers all aspects of PHR’s
  • Prep work
  • PHR Meetings
  • PHR Field Audits

– The “Header section” is common to most of the PHR tabs
  • Data entered will auto-fill in all other Header sections
  • Data can be entered or corrected from any tab’s Header
## PHR Meeting Attendees

### Project Title:
(enter Project Title / desc of work for non-project work)

### Plant Name:

<table>
<thead>
<tr>
<th>PHR Type: Construction</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>PHR Facilitator:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Contractor / Consultant / Work Group:</th>
</tr>
</thead>
</table>

### PHR Meeting Attendees:

<table>
<thead>
<tr>
<th>Must...</th>
<th>Invited to PHR</th>
<th>Attended PHR</th>
<th>Name</th>
<th>Company</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Construction PHR</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHR Facilitator</td>
<td>Attend</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vale Project Manager</td>
<td>Attend / Review</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vale Project Engineer / PEC</td>
<td>Attend / Review</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Vale Representative for contracted work</td>
<td>Attend</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vale Project-Specific Safety Coordinator</td>
<td>Attend</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Design Team Leader (DTL) (Vale or Consultant)</td>
<td>Be Considered or Attend if engineering done at CED</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vale Operations Representatives (Management)</td>
<td>Attend</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vale Maintenance Representatives (Management)</td>
<td>Attend / Review</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vale Operations and Maintenance Representatives(s) (Workers)</td>
<td>Be Considered also consider up/down stream or cross-boundary reps</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vale Safety Dept Representative(s)</td>
<td>Attend / Review</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vale Occupational Health Representative(s)</td>
<td>Attend / Review</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vale Environmental Representative(s)</td>
<td>Attend / Review</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Attend:
*this individual must be present during the meeting or send an authorized designate. The meeting is not to proceed without this individual.*

### Attend/Review:
*it is recommended that these individuals be present during the meeting. If not, these individuals should review the PHR Minutes and provide feedback to the Facilitator.*

### Be Considered:
*these individuals should be invited as applicable to the specifics of the work*

### Invited:
*these individuals must be invited to the PHR Meeting. They can accept, send a designate, decline. The meeting will proceed regardless of the attendance.*
Attendee Requirements Depend on PHR Type

- The template has “smarts” built into it to display the correct roles for that PHR Type
- Those requirements were defined by Vale senior management
- The Vale Rep is responsible for the workplace … we all have legal and moral accountabilities

PHR’s and Due Diligence

- The Vale Rep is responsible for the workplace
- We all have legal and moral accountabilities around Health & Safety
- PHR’s don’t change those accountabilities … doing good ones can help prevent harm!

When you’re selecting attendees, consider:

- PHR’s are done in a team atmosphere
- Why do we do PHR’s:  
  
  (... *To not hurt people* ...)

---

78
PHR Template

Attendees Tab

- Check the Header information (Project title, Contractor, Date, etc…)

- Attendees required depends on PHR Type
  - Select the PHR Type from the drop-down list (or on the PHR Type tab)
  - Refer to the Blue Italics Instructions in the upper-left corner

- Review attendee requirements with the Vale Rep
  - Suggest potential attendees for the PHR Meeting
  - Identify if anyone else should review after the meeting
  - The Facilitator (Vale Rep) is responsible … we’re all accountable for Health & Safety in the workplace
  - The goal is to have the right people in the room to
    - Identify Hazards and Controls
    - And help Communicate these to the Workers and others
Attendees, Cont’d – Speaker’s Notes

Attendance “Sign-In” Sheet

– Blue or Red buttons on the template are “smart” buttons
– The “Print Sign-in Sheet” button carries the names and other info to that sheet
– Another button allows you to attach the Attendance Sheet to the file

Missing Attendees

– The right path depends on the circumstances – every situation is different
– The Facilitator will decide how to proceed

– Any Questions on this tab?
PHR Template

Attendees Tab  Continued …

- Meeting Attendance “Sign-in” Sheet can be printed from this tab
  - It auto-fills the names you listed on the Attendees tab
  - There are no signatures required

- Facilitator will always be the Vale Rep, not Contractors / Consultants

- If a "Required" attendee is missing, discuss with the Facilitator
  - Continue with the meeting, and Review with the missing parties later
  - Cancel the meeting and Reschedule
  - Continue, but have a 2nd PHR meeting to discuss certain items
  - etc…
## Project Navigator

### PHR Methodology

<table>
<thead>
<tr>
<th>Project Title:</th>
<th>(enter Project Title / desc of work for non-project work)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant Name:</td>
<td>Oracle Plant #:</td>
</tr>
<tr>
<td>PHR Type:</td>
<td>Complexity:</td>
</tr>
<tr>
<td>PHR Facilitator:</td>
<td></td>
</tr>
<tr>
<td>Contractor / Consultant / Work Group:</td>
<td></td>
</tr>
<tr>
<td>Date:</td>
<td>Document DM#:</td>
</tr>
<tr>
<td>Rev #:</td>
<td>PO#:</td>
</tr>
</tbody>
</table>

**Attachment(s):**

- PHR Minutes and SHE Review Minutes from previous Stages
- Constructability Reviews
- HAZOP CONSIDERATIONS (optional - see tab in this document)
- Other relevant documents

**Reference File(s):** (list or attach)

**Overview of Scope:**

**List Methodology**

* For Construction, Service Work, Maintenance or Commissioning PHR's list the tasks in the sequence they will be done, including major equipment, tie-ins, unusual circumstances and any unusual hazardous materials

1. 
2. 

### PHR guidelines are available

- **Internally:** [Project Navigator Toolkit](#)
- **Externally:** [PMO Extranet Website](#)
Preparing / Pre-Screening

– Ideally, the Vale Rep and the contractor / consultant assemble this info as a joint effort

– This information **must** be sent out with the Pre-Screened PHR to all meeting Attendees

Reviewing with Attendees

– If the attendees don’t understand the work, can they really assess the Hazards? (… No!…)

– To assess Hazards and Controls, we need to understand the issues around
  
  • the Work … and the Workplace … and the Workers

– There are a lot of interactions between those 3 things …

**Ask:** Can you give me any examples?
PHR Template

Methodology Tab

– The Vale rep, or the Contractor / Consultant can prepare this info
  • The Vale Rep must review before meeting invitations are issued

– Review the following info with the PHR attendees
  • Facilitator may ask the Contractor / Consultant to lead that review
  • All PHR attendees must understand this info before starting the next step
  • To assess Hazards and Controls, we need to understand:
    – the Work …
    – and the Workplace …
    – and the Workers
Overview of Scope

– This box is a fixed size … if the Overview won’t fit in the box, maybe there’s too much to cover in one PHR meeting!

– The “right” amount of detail depends on the circumstances – every situation is different
  • Where possible, include Scope items that could create major Hazards

– If the Workers won’t understand it … have we done our job? (… No! …)
PHR Template

Methodology Tab  Continued …

– Overview of Scope
  • Short, simple description of scope
  • Include all major scope items … and other items that could introduce additional hazards
    • E.g. a small amount of asbestos removal done as part of a bigger project
  • This is for the Workers, and other Stakeholders
Reference Documents

– Why should previous PHR’s & Safety Reviews be included?  
  (… learn from previous jobs  
  … build up our collective knowledge of Hazards and Controls …)

– How many drawings should be included?  
  (… only the main ones …)

– Ensure the main supporting documents are available at the meeting
  • Full-size drawings are best, or at least 11x17
  • Print copies of all for the attendees if possible
Reference documents to be listed / attached

- Related PHR’s / Safety Reviews
- Contract-Specific Safety Plan
- Scope of Work
- Key Drawings – Plot Plans, main Plan / Elevation dwgs, P&ID’s, PFD’s
- Photos / Video
- Schedule
- Other docs that give Battery Limits, important background info, etc…
Work Methodology - Construction

– Why mention the types of equipment that will be used? (… identify Hazards & Controls … know who to invite to meeting e.g. Crane Operator …)

   Use the “Fraco” story …

– Why include the known Hazards & Controls in the line items? (… so Attendees think about those items … so they don’t have to be included in the PHR Minutes if they aren’t Critical – but workers will still see them …)

– How many lines should be included? (… only as many as people will read and absorb … Depends on the job! …)

Design / FEL Study PHR’s

– New materials could include process materials, or new cleaning chemicals required for Maintenance work, or other products…

Any Questions on this tab?
PHR Template

Methodology Tab  Continued …

– Work Methodology
  • Use short, simple descriptions – avoid jargon / acronyms
  • List major equipment being used (e.g. Cranes, Bosun’s chair, etc…)
  • Mention the known Hazards and Controls in the methodology lines, wherever possible

  • For Design / FEL Study PHR’s - list any new Production Processes or Materials that are being introduced
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Hazard Checklist tab – Speaker’s Notes

Dates etc … for Related Commissioning PHR / Constructability Review

– The date & location fields were added to help make sure these meetings actually happen
  • How long does Commissioning take? (… depends on the job … a few days …)
  • How much notice should we give for a PHR? (… a week or two …)
  • If we wait for the end of Construction to schedule the Commissioning PHR… it’s already too late!
– Another button allows you to attach the Attendance Sheet to the file

Hazard Classes – Just check them off

– Don’t waste time talking about the details of Hazards here …
– You’ll just have to do it all over again, when you get to the Meeting Minutes tab
– It’s ok to check off a Hazard, and decide later it doesn’t need to be included
  • That’s better than not checking one, and missing a Hazard that needs attention!

Any Questions on this tab?
PHR Template

Hazard Checklist Tab

– Where applicable, fill in the date(s) for the related
  • Commissioning PHR
  • Constructability Review

– The Hazard Classes are listed to stimulate discussion
  • Check off each of the Hazard Classes that apply
  • Don’t discuss the details at this point, just check them off

– Hazard Classes are listed alphabetically
  • The same Hazard Classes are listed on the Hazard Triggers tab
## ASPHYXIATION

1. Is there potential to generate inert / toxic gases in the area?
2. Is there adequate ventilation in the area?
3. Is there a requirement for permanent Air Quality monitoring devices?

## COMMUNICATION

1. Are there any potential interference with communications systems? (PA system, INVAC/OUTVAC, communication to control room, radio frequency etc.)
2. Are there any additions that could obstruct existing warning lights/alarms, signage, etc.?
3. Is there a need for any new signage, labeling, warning devices, etc.?
4. Does the design introduce a change that needs to be communicated to anyone?

## CONFINED SPACE

1. Will the design create / contribute to an unavoidable confined space situation?
   If so, has the design considered: rescue equipment hitch points, access/egress, rescue access, etc.)
2. For tanks or other equipment - are double-block-and-bleed valves, removable pipe spools, or line blinds required on any piping feeding the confined space?
3. Is any positive locking required for equipment feed chutes, conveyors, etc. that feed the confined space?

---

Refer to the PMO Extranet Site for Vale Programs, Policy’s, SPIs to identify existing Vale prevention controls:
[extportal.vale.com](extportal.vale.com)

### ASPHYXIATION

Consider the following ASPHYXIATION Hazards:
- Exhaust from combustion engines either identified or not identified in the area
- Intake air exchange units bringing in toxic fumes or vapors
- Poor air quality
- Confined space not identified

Consider the following ASPHYXIATION Mitigation:
- Confined spaces work permit required
- Air Quality checks
- Review Policy & Procedure for Confined Spaces (consider this as a main hazard)
- Identification
- Training Emergency preparedness
- Recirculation / redirection of UG ventilation
- UG Equipment ventilation requirements

### COMMUNICATION

Consider the following COMMUNICATION hazards:
- Line of sight / No line of sight communication
- Working alone
- Cross Shift Communication (lack of, or mis-communication)
- Language Barriers
- Hearing Impairment (hearing loss/damage, and/or high noise levels)
This is an Optional Tab

– The Hazard Triggers were developed to capture our “tribal knowledge”
– Like the Hazard Classes, the Triggers are there to stimulate discussion and thinking

– The Trigger list keeps changing
  • new items are added or combined with existing ones, and the wording keeps improving
  • Use the up-to-date template from the website to make sure you have the latest list

– If you have suggestions, contact Trueman Hirschfeld
PHR Template

Hazard Triggers Tab

– This is an Optional tab
  • Most users find it helpful
  • It can be printed for review from the “Print PHR” button on any tab
  • There is no Header section - it doesn’t need to be included with the published PHR Meeting Minutes

– Review the Hazard Triggers tab before the meeting, to
  • Identify Hazards within the “checked” Hazard Classes
  • Identify Hazards in other classes

– The Hazard Triggers are grouped by Hazard Class
  • They are listed in the same order as on the Hazard Class tab
  • Both Hazards and Controls are listed
  • A “bullet” format is used on the Hazard Triggers tab
Use of Highlighting

- Colored highlighting seems to help people
- If you review the Trigger list on the computer, use the cell highlighting in Excel
- If you review it on paper, use a highlighter marker

Design PHR’s / FEL Study PHR’s

- The Design Hazard Triggers
- If you review the Trigger list on the computer, use the cell highlighting in Excel
- If you review it on paper, use a highlighter marker

Any Questions on this tab?
PHR Template

Hazard Triggers Tab,  Continued

– Highlight each of the Hazard Triggers that apply
  • Or add a “Checkmark” in the left-hand column

– It’s not practical to review every Trigger item in the meeting
  • Provide highlighted paper copies for each attendee

– For Design / Study PHR’s
  • Use the Design Hazard Triggers tab
  • These were developed with CED specifically for Design PHR’s
  • Full sentences are used on the Design Hazard Triggers tab – these can be copied and pasted directly to the Minutes tab if appropriate
## PHR Minutes

**Project Title:** (enter Project Title / desc of work for non-project work)  
**Plant Name:**  
**Oracle Plant #:**  
**PHR Type:** Construction  
**PHR Facilitator:**  
**Contractor / Consultant / Work Group:**  
**Name Dept / Co Status**:  
**PO#:**  
**Document DM#:**  
**Rev #:**  
**Date:**  
**PO#:**  
**PHR Type:** Construction  
**Date:**  
**PHR Facilitator:**  
**Contractor / Consultant / Work Group:**  
**Name Dept / Co Status**:  
**PO#:**  
**Document DM#:**  
**Rev #:**  

### Event / Issue

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<th>EVENT / ISSUE</th>
<th>HAZARD CLASS</th>
<th>EXISTING PROTECTION</th>
<th>ACTION</th>
<th>ACTION BY / STATUS</th>
<th>Review with… (optional)</th>
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**Guidance:** 
- Click here to hide.

**Descriptive Guidance:**
- **EVENT / ISSUE:** Describe the event or issue using a complete sentence. Include the most significant consequences of the event or issue.
- **HAZARD CLASS:** List only existing protection (Policies, Programs, Standards, SPIs, etc.) that are already in place under Vale or the Contractor and/or includes specifics to a level of detail appropriate for the hazard). For Design PHRs, Existing Protection includes what has already been included or addressed in the design.
- **EXISTING PROTECTION:** List any new or additional controls that will be put in place for this task to mitigate the hazard or if a construction hazard has been identified in the Design PHR for further action during the Construction PHR. Where applicable, specify how this control will be communicated to the affected workers or other stakeholders. Ensure all statements listed are action phrases e.g. "Audit tie-off points for all workers daily and document." is preferable to "Workers must tie-off to proper anchor points.”
- **ACTION BY / STATUS:** Identify one individual’s first and last name. Identify the Company / Vale Dept that this individual works for. Select the appropriate status (optional use). Supervisors, Workers, Other.

**Legend:**
- “X” use as appropriate.

**Record View:**
- **Item #:** 1
- **EVENT / ISSUE:** (What if / Consequences)
- **HAZARD CLASS:**
- **EXISTING PROTECTION:**
- **ACTION:**

**Review / Group:**
- **Supervisors**
- **Workers**
- **Other**
- **Print PHR**
- **Print By Review Group**
- **Print By Record View**
- **Entry By Record View**

**Project Title:**
- (enter Project Title / Desc of work for non-project work)

**Entry By:**
- Record View

**Print By:**
- Review Group

**Print PHR**
Meeting Minutes tab – Speaker’s Notes

Record View
- This is one of the most useful features in the template – Try it out!

The Scribe’s role
- Typing live on screen in front of other people
  - Helps make sure items aren’t missed / or misconstrued
  - Allows others to suggest clearer wording
  - Is very tough … take it easy on the scribe, and be patient
- Pre-typing some of the PHR Minutes before the meeting is a good idea
  - The “sweet spot” seems to be ½ to ¾ of the info
PHR Template

Meeting Minutes Tab

- Help text is provided for each column, in *blue italics*

- Use the “Entry By Record View” button
  - This helps attendees focus on the item being discussed
  - It’s the only way to see the entire line on screen at once
  - All edits done in “Record View” appear in “Table View” and vice-versa

- This is the “hard” part
  - Most of the discussion in the meeting takes place here
  - The Facilitator may have to deal with conflicting opinions
  - Getting the wording “right” requires a good Scribe, and patience
  - *This is also the part that matters the most!*
Think About who will read this document

- Will the workers read 50 or 100 line items in a PHR? (… “Not likely” …)
- … Or will they flip to the signoff sheet, and then head to work? (… “Probably” …)

- How many lines should a typical PHR include?
  (… “Depends on the circumstances” … “About 10 or 15”…)

Meeting Minutes tab, cont’d – Speaker’s Notes
PHR Template

Meeting Minutes Tab, Continued

– Think about who will read this information
  • Use language that they will understand and relate to

– Make sure all of the info on a line “fits together” properly:
  • the What If?
  • the Hazard Class
  • the Existing Protection
  • the Actions
    • Clear
    • Simple
    • Easy to Follow

– If the workers or other stakeholders don’t “get it”
  • we’ve wasted our time
  • … and someone could get hurt because a hazard wasn’t clear!
What If statements

- Using a consistent style makes it easier for readers to follow
  - Always put the “What If” at the beginning
  - Make it a question – include the question mark at the end of the line
- This is tougher for Design PHR’s
  - Some Design issues might relate to many events
  - Use a sentence structure that will make the problem clear
PHR Template

Meeting Minutes Tab, Continued

– Work from the HAZARD CLASS items that were checked off
  • It’s okay to have several Hazard Classes listed for one line in the Minutes
  • Use the Hazard Triggers list to help develop “What If?” questions

– Add a "What if" question in EVENT/ISSUE column
  • Describe the Event or Issue using a complete sentence
  • Include the most significant consequences of the event or issue
  • Use short, simple, direct questions
  • Avoid acronyms and technical terms – or provide definitions
Existing Protection

- If a Procedure is your company standard, and it’s usually enforced
  - That is an Existing Protection

- If a new Procedure has been drawn up and approved by Vale, but it’s not yet in place
  - That is not an Existing Protection - it belongs in the ACTION column

Ask one of the questions below – depending on the group being trained

- Contractors: A Guardrail is going to be installed as part of the Scope of Work
  … is that an Existing Protection for a **Construction** PHR?  ( … No! It’s not there yet …)

- Consultants: A Guardrail to be installed as part of the Design is on the drawings
  … is that an Existing Protection for a **Design** PHR?  ( … Yes - it’s already there …)
List the EXISTING PROTECTION (Hazard Controls)

- Only list Existing Protection that is actually in place already
  - Procedures, training programs, standards, etc… that are enforced
  - Physical Controls (guards, sensors/alarms/trips, safety valves, etc…)
- For Design PHR’s: items already included in the spec.’s / drawings

- Where useful, include the relevant document title & number
  - Include excerpts that provide specific details
  - Provide a level of detail that’s appropriate for the hazard
    … and for the knowledge/experience of the workers
Existing Protection field Left Blank

– If there’s no Existing Protection worth listing, and there’s no Action item
  … do we really need this line item in the PHR?  (… No! …)

Motherhood Statements

– They don’t add any value for the workers
– This is not primarily a Due Diligence document
  • Put that stuff in your contract-specific Safety Plan, or other documents
PHR Template

Meeting Minutes Tab, Continued

- The EXISTING PROTECTION can be left blank, if
  - There’s nothing new or significant to mention (e.g. the workers already know all that stuff), and / or
  - There are no existing controls in place

- Include an ACTION item in either case

- **Do not** include general "motherhood" statements!
  - E.g. “PPE.” or “Policies, standards and legislation.”
Documentation-Type Action Items

- Don’t turn *every* Action Item into an Inspection or Audit
  - Focus on biggest risks / likeliest problems
  - Or if there’s a history of non-compliance
PHR Template

Meeting Minutes Tab, Continued

– List the ACTIONS (Additional Controls Required)

– These Controls must mitigate the Hazard
  • Physical Controls (guards, sensors/alarms/trips, safety valves, etc…)
  • “Administrative” Controls (Procedures, Training, PPE, etc…)

– Specify how Controls will be communicated

– Where needed, include documentation requirements
  • E.g. Audits / Inspections, reports, etc…
  • Be careful not to pile on unnecessary paperwork!
Meeting Minutes tab, cont’d – Speaker’s Notes

Action field Left Blank

– The ACTION column can be left blank if the Existing Protection will fully Control the Hazard

– If there’s no Existing Protection worth listing, and there’s no Action item

… do we really need this line item in the PHR? (...No! ...)

Motherhood Statements

– They don’t add any value for the workers

– This is not primarily a Due Diligence document

  • Put that stuff in your contract-specific Safety Plan, or other documents

Any Questions on this tab?
Meeting Minutes Tab,  Continued

- All ACTION statements must be action phrases
  - All should be a full sentence, and must include a verb

- All statements must be auditable
  - "Audit tie-off points for all workers daily and document." is much better than:
  - "Workers must tie-off to proper anchor points."

- All ACTION statements must be assigned to one individual
  - Include their First & Last Name, plus the Company / Dept

- Do not include general "motherhood" statements!
  - E.g. “Follow good trade practices.” or “Comply with relevant legislation.”
# Workers Sign Off Sheet (PHR)

<table>
<thead>
<tr>
<th>No.</th>
<th>Print Name</th>
<th>Signature</th>
<th>Company</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
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<td>2</td>
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</tbody>
</table>

- **Project Title:** (enter Project Title / desc of work for non-project work)
- **Plant Name:**
- **PHR Type:** Construction
- **PHR Facilitator:**
- **Contractor / Consultant / Work Group:**
- **Oracle Plant #:**
- **Date:**
- **Document DM #:**
- **Rev #:**
- **PO #:**

**Print PHR**

**Attach Signatures File(s)**
Worker Sign-off tab – Speaker’s Notes

Jobsite Orientation Training (optional)

- Document Reviews:
  - Construction PHR
  - Contract-Specific Safety Plan
  - Special Procedures, JSA’s, etc …
  - Training records

- Field-walk:
  - Jobsite
  - Trailer location, hygiene facilities (Dry), etc…
  - First Aid office location
  - Assembly areas (INVAC / OUTVAC)
  - Safety Showers, Eyewash Stations, Refuge Stations, etc…
  - And the Travel routes between each
PHR Template

Worker Sign-off Tab

- Workers must sign the Worker Sign-off Sheet
  ... before starting any work on the tasks covered by the PHR
- Mandatory for all workers, including all Subcontractor workers
- Send signoff's to Vale Rep
- Ideally, do PHR Review as part of "Jobsite Orientation" training

- If new Hazards or Controls are identified
  … all workers affected by the change must sign off on the revised PHR
**HAZOP CONSIDERATIONS**

**Project Title:** (enter Project Title / desc of work for non-project work)

<table>
<thead>
<tr>
<th>Item #</th>
<th>Node / Section</th>
<th>Parameter</th>
<th>Deviation</th>
<th>Consequence / Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<td>3</td>
<td>&quot;Node&quot; or section of piping / electrical / instrument system that is being reviewed</td>
<td>List the parameter being reviewed: - temperature - pressure - flow - density - current - voltage - speed - rate - etc...</td>
<td>List the &quot;deviation&quot; (change) in the Parameter: - increase - decrease - sudden stop - etc...</td>
<td>Describe the consequences of the Deviation in the listed Parameter for that Node/Section. This will become the &quot;What If&quot; statement in the PHR Minutes tab</td>
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Note: other tools may be more suitable for documenting a formal HAZARDS and OPERABILITY REVIEW for large-scale process changes.

**Plant Name:**
**Oracle Plant #:**

**PHR Type:**

**PHR Facilitator:**

**Contractor / Consultant / Work Group:**

**Date:**
**Document DM #:**
**Rev #:**

**Project #:**
**Work Order #:**
**Eng. Job #:**
**PO #:**

**HAZOP:** use this form to help identify the potential consequences of making changes to Operating processes or changes to the Operation of specific equipment / systems. Refer to the Engineering HAZOP Guideline (GUID-02001).
HAZOP Considerations tab – Speaker’s Notes

For more info, contact

– Trueman Hirschfeld
– or the Vale Process Technology group
PHR Template

HAZOP Considerations Tab

- Optional tab
  - Used for Hazards related to changes in Processing Operations
    - Changes in flowrate / pressure / temperature / pH / etc…
  - Provides a way to break up an analysis into
    - Node / section
    - Deviation in a Parameter within that Node / Section
    - Consequences
  - The consequences from the HAZOP tab feed into the Minutes tab

- Useful … requires an experienced Facilitator
<table>
<thead>
<tr>
<th>Item #</th>
<th>ACTION (Additional Controls Required)</th>
<th>Name</th>
<th>Dept / Co</th>
<th>Audit Result</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
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</tbody>
</table>
If you have any suggestions for improvement, contact

- Trueman Hirschfeld
PHR Template

PHR Field Audit Tab

– Optional tab

– Used to audit Action items from the PHR

– Action items data is transferred automatically to this tab
  • ACTION description
  • Name of Responsible person
  • Dept / Co

– Provides an area to write in Audit Results for each line item
  • E.g. Acceptable / Unacceptable

– And a Comments area
Follow-Up – Speaker’s Notes

Post PHR

– A Documentation Audit Form is available to review the final documents against the standards
– A Meeting Audit Form is also available
PHR Template

Follow-Up – After the PHR

- Make sure all Attendees are clear on the next steps
  - If there are unresolved Hazards another meeting is required
  - If anyone else has to review the document another meeting may be required
  - Or if specific Action Items must be completed before work can start
  - Update any other related documents (Contract-Specific Safety Plan, etc…)

- Specify who will publish and email the finalized PHR to
  - All Attendees, Reviewers and other stakeholders

- If new Hazards or Controls are Identified, a new or revised PHR may be required
  - It may involve all the same Attendees, or some different resources
<table>
<thead>
<tr>
<th>#</th>
<th>Audit Questions</th>
<th>Acceptable (Yes / No / NA)</th>
<th>Feedback</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>If the Contractor/Consultant has pre-populated the PHR, the Facilitator has pre-screened the document prior to the PHR Meeting to ensure PHR Template Checks are complete?</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Appropriate meeting handouts were provided?</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>PHR Facilitator ensured all required meeting attendees were present?</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Facilitator (or designate) reviewed project background (Scope of Work and battery limits, Contract Specific Requirements)?</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Facilitator (or designate) reviewed Methodology?</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Facilitator (or designate) reviewed any supporting documents, if applicable?</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Facilitator (or designate) reviewed Contract Specific Safety Plan (and no duplication of these items were entered on the Meeting Minutes tab of the PHR)?</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Facilitator (or designate) reviewed PHR Hazards Checklist, and/or Scribe updated based on group input?</td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>
## PHR Documentation Audit

### yellow fields are required to be completed

<table>
<thead>
<tr>
<th>#</th>
<th>Audit Questions</th>
<th>Acceptable (Yes / No / NA)</th>
<th>Feedback</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Post PHR Meeting</strong></td>
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</tr>
<tr>
<td>1</td>
<td>Was the correct template used? (NAV-TP-0019 v17+)</td>
<td></td>
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</tr>
<tr>
<td>2</td>
<td>Facilitator (or designate) filed PHR according to local document management standards for the area?</td>
<td></td>
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<tr>
<td><strong>Attendees Tab</strong></td>
<td></td>
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<tr>
<td>3</td>
<td>Were all required attendees at the PHR Meeting? (or justification provided as to why any &quot;Required&quot; attendee(s) were absent, or did not send a designate)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Did the PHR Facilitator listed receive PHR_IN_CLASS training?</td>
<td></td>
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<tr>
<td>5</td>
<td>PHR heading information is completed and correct?</td>
<td></td>
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</tr>
<tr>
<td><strong>Methodology Tab</strong></td>
<td></td>
<td></td>
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<tr>
<td>6</td>
<td>Were the main supporting documents listed/attached?</td>
<td></td>
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<tr>
<td>7</td>
<td>Was the Overview of Scope clearly summarized?</td>
<td></td>
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<tr>
<td>8</td>
<td>Was a Methodology or List of Processes/Materials listed/attached?</td>
<td></td>
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<tr>
<td><strong>Hazards Checklist Tab</strong></td>
<td></td>
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<tr>
<td>9</td>
<td>Hazard Classes identified with an &quot;X&quot;?</td>
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</tr>
<tr>
<td><strong>Minutes Tab</strong></td>
<td></td>
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<tr>
<td>10</td>
<td>&quot;What if&quot; or consequences clearly written in EVENT/ISSUE column?</td>
<td></td>
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<tr>
<td>11</td>
<td>The HAZARD CLASSes listed on the Minutes tab align with those identified on the Hazard Checklist?</td>
<td></td>
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<tr>
<td>12</td>
<td>EXISTING PROTECTION column only lists existing protection currently in place by Vale and/or the Contractor (with document title &amp; number, or specific details to a level appropriate for the hazard)</td>
<td></td>
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<tr>
<td>13</td>
<td>EXISTING PROTECTION column does not list general &quot;mother hood&quot; statements?</td>
<td></td>
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<tr>
<td>14</td>
<td>ACTION column statements are only new or additional controls that will be put in place to mitigate the hazard and are phrased as action statements?</td>
<td></td>
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<tr>
<td>15</td>
<td>ACTION BY columns are assigned to only ONE individual?</td>
<td></td>
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<tr>
<td>16</td>
<td>If this is a PMO Project Construction PHR has the Commissioning PHR been scheduled?</td>
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<tr>
<td><strong>Workers Sign Off Tab</strong></td>
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<tr>
<td>17</td>
<td>If work has started/ended, have Workers signed the Worker Sign-off Sheet and it is attached to the source PHR file?</td>
<td></td>
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<td>18</td>
<td>If work has started/ended, have all Sub-Contractors / Tech Reps signed the PHR?</td>
<td></td>
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</tbody>
</table>

### Attach PHR File(s)
PHR Workshop: Re-Roofing a Residential Garage

- This part of the session will take about an hour
- You will all get some practice actually working through the process and filling out the template

- And it will be more fun than listening to me talk … !
1. Workshop Instructions
2. Review of Scope & Methodology
3. Assign Hazard Classes
4. Team Exercise
5. Review with the Other Teams
Workshop Materials - Methodology:

- Overview of Scope – read it aloud to the class

- Who is this info for? (… Client … Supervisors … Workers … others…)

- Would those people understand what’s written here? (… Yes … simple, clear language …)

- Work Methodology – ask the class to read over it

- If PHR Attendees don’t know how the work will be done, how can they assess the hazards? (… They can’t!…)

  E.g.: Are there different hazards if the shingles are hoisted to the roof:

  a) by hand-bombing them up the ladder, or b) using a boom-truck ??

  Are different Controls needed for these hazards?

  Do different people need to be involved in assessing the Hazards & Controls?

- Some of the Controls are mentioned in the Methodology lines – give an example.
Workshop

Instructions

– There’s a copy of the Workshop materials on each table
  • We’ll review the background, the Scope Overview and some of the Methodology as a group

– Each table will be assigned one Hazard Class

– Working as a team, you are to do a Construction PHR
  • Appoint a Scribe to fill out the Minutes tab
  • Review the Pre-screened PHR and the Reference documents
    – Carefully review the Scope, Methodology, and Hazard Triggers
  • Create three very well written PHR line items on the Minutes tab

– One person from each table to report out to the class
  • We’ll discuss what went well, and where you had problems
Workshop Materials - Hazards Checklist:

- The pre-screened PHR might have missed a few things

  E.g.: Are there any Hazard Classes missing? (… Work At Heights … others …)

During the Workshop:

- Monitor the tables, answer questions as needed, or make suggestions
- Cut off the discussion after about 15 minutes or so
- Have a rep from each table read one PHR item
  - Briefly comment on pro’s and con’s of each
  - Or ask the class to comment
  - Watch for incomplete / unclear wording, and mixing up Existing Protection vs Actions
- Now ask each table to hand their Minutes tab sheet to the next table over
  - Have each table spend about 5 minutes reviewing another tables results
  - Have each comment on what they read, and whether it was easy to follow

End of Workshop portion
PHR Workshop

Workshop Materials:

<table>
<thead>
<tr>
<th>Pre-screened “Draft” PHR</th>
<th>Reference Documents</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHR Checklist</td>
<td>Plot Plan Drawing</td>
</tr>
<tr>
<td>Attendees sheet</td>
<td>Photo – View from the street</td>
</tr>
<tr>
<td>Methodology</td>
<td>Safety, Health &amp; Environment Checklist</td>
</tr>
<tr>
<td>Hazards Checklist</td>
<td></td>
</tr>
<tr>
<td>Hazard Triggers</td>
<td></td>
</tr>
<tr>
<td>Meeting Minutes - Blank copy</td>
<td></td>
</tr>
<tr>
<td>Worker Sign-off Sheet - Blank copy</td>
<td></td>
</tr>
<tr>
<td>PHR Field Audit Form</td>
<td></td>
</tr>
</tbody>
</table>
# Safety, Health and Environment Checklist

**Project Title / Desc of Work:** PHR Training - Re-roof Residential Garage - Lot 52

**Project #:** 123456  
**Work Order #:** 654321-1

<table>
<thead>
<tr>
<th><strong>Plant Name:</strong></th>
<th><strong>Oracle Plant #::</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Project Stage:</strong></th>
<th><strong>Complexity:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>Low</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Owner:</strong></th>
<th><strong>Sponsor:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>John Smith</td>
<td>Jane Smith</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Vale Project Manager:</strong></th>
<th><strong>Contractor / Consultant / Work Group:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>T.Hirschfeld</td>
<td>ABC Roofing Inc.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Contract #:</strong></th>
<th><strong>PO #:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>654321</td>
<td>654321-1</td>
</tr>
</tbody>
</table>

**Date:** 6/1/2015  
**DM#:**  
**Rev #:**

This checklist is **mandatory** for all PMO project work, and is recommended for use by other groups when preparing Contracts or planning work to be done by Vale personnel and is to be completed / reassessed at the beginning of each project stage and for Operating Projects during scope of work development.

*If Yes or Unsure is selected for any item, you must contact the appropriate Department(s) for further discussion.*

### Sudbury - Environment Contacts

### Sudbury - Safety Contacts

### Sudbury - Occupational Health Contacts

## RISK ASSESSMENT CHECKLIST

### GENERAL

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Unsure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Have the Vale Representative and the Vale Contract Manager been identified for the work?</td>
<td></td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

### ENVIRONMENT

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Unsure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Will a new building, process, stack or emission source be constructed or an existing one modified?</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Will pipelines, tanks or process equipment be installed or modified?</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Will combustion equipment be installed or modified?</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Will a building or a major part of a building be demolished?</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Will demolition be done that will result in the generation of any wastes?</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Will the work itself generate other liquid or solid wastes, hazardous or otherwise?</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Is the work related to a process change that could affect waste generation?</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Will the work involve any material excavations such as soil?</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Will the work include material handling activities such as excavation or haulage by truck? Will the work result in a change in noise levels that may be audible at the fence-line?</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Will any processes or plants be built or modified that could change the quantity, quality, manner of discharge or manner of treatment of effluent (water discharges)?</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Will the work involve the installation or modification of water intake structures?</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Will processes that use process water or cooling water be built or modified?</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Will any dams, ponds, ditches, clarifiers, tanks or similar structures be built or modified?</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Will water be pumped from a creek, lake, pond, mine or other structure?</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Will any work be done in or near a creek, pond, river, lake or other water body?</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Will the work result in a change in noise levels that may be audible at the fence-line?</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Will any tailings, waste rock, ore or other similar materials be stored, moved or handled?</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Will any new ore extraction, mine construction, open pit development, etc. be done?</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Will any new materials or feeds be processed?</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Will any new land be cleared or existing disturbed land be converted to another use?</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Will the activity occur within the existing closure boundary?</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Are any chemicals, fuels, lubricants, process fluids, etc. being added, eliminated or used in a different manner?</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Are there any opportunities to decrease greenhouse gasses, energy usage, water usage, waste generation, noise, air emissions, environmental footprint or community impact?</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

### SAFETY

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Unsure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Will the work include work groups that have never previously worked on Vale sites?</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Will the work potentially require a Young Worker Awareness presentation?</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Will the work include work at heights (1.8m or more) that is non-routine?</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Will the work include operation of new / unusual types of Mobile Equipment?</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Will the work require energy isolation (Lock out / Tag out) with non-routine requirements?</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Will the work include &quot;live&quot; electrical work, or work in areas with open busbar?</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Will the work include Non-Standard or Critical Lifts? (Refer to NAV-GP-0086 for defn.'s)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Will Confined Space work with non-routine hazards / possible IDLH conditions be required?</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Question</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>---</td>
<td>--------------------------------------------------------------------------</td>
<td>-----</td>
<td>----</td>
</tr>
<tr>
<td>9</td>
<td>Will the work include working with explosives, other than routine Blasting activities underground?</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>10</td>
<td>Will the work include operation of machinery/equipment when safeguards are disabled?</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>11</td>
<td>Will the work require a PHR, MOC or other form of risk assessment? (if &quot;Yes&quot;, invite GSO Rep to meeting)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Will the work result in changes to the current Emergency Preparedness Plan?</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>13</td>
<td>Will the work require a Notice of Project with the MOL?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**OCCUPATIONAL HEALTH**

<table>
<thead>
<tr>
<th></th>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>Unsure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Will the work involve a building which may contain asbestos-containing material?</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Will the work involve the installation, removal or alteration of lead-coated surfaces?</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Will the work require the use or disturbance of materials that may contain designated substances (silica, isocyanates, asbestos, mercury, arsenic, lead)?</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Will a process be installed or modified that generates a new chemical mixture / hazardous material?</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Will a ventilation system supplying a building or work area be installed, modified, or removed?</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Will a new noise source (equipment / process) be installed or an existing source altered?</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Will the work involve installation of new equipment, work stations or control rooms?</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Will the work affect the water supply / distribution system for the site?</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Could the work potentially create IDLH conditions?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Could the workers potentially be exposed to unusual heat stress / cold stress?</td>
<td></td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>
**Process Hazards Review (PHR)**  
*Select the appropriate PHR type*

**NAV-TP-0019 (version 19)**

- **FEL 1**: Design
- **FEL 2**: Construction / Field Work
- **FEL 3**: Commissioning

(used for Mtce / Ops tasks)

---

**PHR Meeting Roles**

**Facilitator**: A Vale Representative responsible for the PHR. Initiates PHR Meeting to appropriate personnel, forwards all relevant information, ensures the PHR process is followed, facilitates discussion, ensures hazards and appropriate control measures are identified, files and distributes completed PHR.

**Participant**: Reviews relevant material and actively participates in PHR process to identify hazards and possible control measure. Communicates PHR outcomes to the group(s) they represent.
## PHR Meeting Attendees

**Project Title:** PHR Training - Re-Roof Residential Garage - Lot 52  
**Project #:** 123456  
**Work Order #:**  
**Eng. Job #:**  

<table>
<thead>
<tr>
<th>Plant Name:</th>
<th>Oracle Plant #:</th>
<th>Date:</th>
<th>Document DM#:</th>
<th>Rev #:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1-Jun-2016</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**PHR Type:** Construction  
**PHR Facilitator:** T. Hirschfeld  
**Contractor / Consultant / Work Group:** ABC Roofing Inc.

### Construction PHR

<table>
<thead>
<tr>
<th>Must...</th>
<th>Invited to PHR</th>
<th>Attended PHR</th>
<th>Name</th>
<th>Company</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHR Facilitator</td>
<td>Attend</td>
<td>x</td>
<td>Trueman Hirschfeld</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vale Project Manager</td>
<td>Attend / Review</td>
<td>x</td>
<td></td>
<td></td>
<td>(same as above)</td>
</tr>
<tr>
<td>Vale Project Engineer / PEC</td>
<td>Attend / Review</td>
<td>x</td>
<td></td>
<td></td>
<td>Not a Vale Project</td>
</tr>
<tr>
<td>The Vale Representative for contracted work</td>
<td>Attend</td>
<td>x</td>
<td>John Doe</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vale Project-Specific Safety Coordinator</td>
<td>Attend</td>
<td>x</td>
<td>Tom Gunn</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Design Team Leader (DTL) (Vale or Consultant)</td>
<td>Be Considered</td>
<td>x</td>
<td></td>
<td></td>
<td>or Attend if engineering done at CED</td>
</tr>
<tr>
<td>Vale Operations Representatives (Management)</td>
<td>Attend</td>
<td>x</td>
<td></td>
<td></td>
<td>Not a Vale Project</td>
</tr>
<tr>
<td>Vale Maintenance Representatives (Management)</td>
<td>Attend / Review</td>
<td>x</td>
<td></td>
<td></td>
<td>Not a Vale Project</td>
</tr>
<tr>
<td>Vale Operations and Maintenance Representatives(s) (Workers)</td>
<td>Be Considered</td>
<td>x</td>
<td></td>
<td></td>
<td>...also consider up/down stream or cross-boundary reps</td>
</tr>
<tr>
<td>Vale Safety Dept Representative(s)</td>
<td>Attend / Review</td>
<td>x</td>
<td></td>
<td></td>
<td>...if any question under the Safety section is answered &quot;yes&quot; on the Safety, Health and Environment Checklist</td>
</tr>
<tr>
<td>Vale Occupational Health Representative(s)</td>
<td>Attend / Review</td>
<td>x</td>
<td></td>
<td></td>
<td>...if any question under the Occ. Health section is answered &quot;yes&quot; on the Safety, Health and Environment Checklist</td>
</tr>
<tr>
<td>Vale Environmental Representative(s)</td>
<td>Attend / Review</td>
<td>x</td>
<td></td>
<td></td>
<td>...if any question under the Environment section is answered &quot;yes&quot; on the Safety, Health and Environment Checklist</td>
</tr>
<tr>
<td>Vale Joint Health &amp; Safety Committee (JHSC) Rep(s)</td>
<td>Be Invited</td>
<td>x</td>
<td></td>
<td></td>
<td>Not a Vale Project</td>
</tr>
<tr>
<td>Vale Process Technology / Mines Technical Service Rep(s)</td>
<td>Be Considered</td>
<td>x</td>
<td></td>
<td></td>
<td>Not a Vale Project</td>
</tr>
<tr>
<td>Subject Matter Experts (SME’s) / other resource personnel</td>
<td>Be Considered</td>
<td>x</td>
<td>Linda Gunn</td>
<td></td>
<td>Not a Vale Project</td>
</tr>
<tr>
<td>Supervisor / Superintendent for the Work Group (Contractor / Vale)</td>
<td>Attend</td>
<td>x</td>
<td>John Wayne</td>
<td>ABC Roofing Inc.</td>
<td></td>
</tr>
<tr>
<td>One or more workers from the Work Group (Contractor / Vale)</td>
<td>Be Considered</td>
<td>x</td>
<td>Ronald McDonald</td>
<td>ABC Roofing Inc.</td>
<td></td>
</tr>
<tr>
<td>Contracting Party SHE Rep (&quot;Safety Coordinator&quot;)</td>
<td>Attend</td>
<td>x</td>
<td>Homer Simpson</td>
<td>ABC Roofing Inc.</td>
<td></td>
</tr>
<tr>
<td>Contracting Party SME</td>
<td>Be Considered</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contractor’s Joint Health &amp; Safety Committee (JHSC) Rep(s)</td>
<td>Be Considered</td>
<td>x</td>
<td>John McHazard</td>
<td>ABC Roofing Inc.</td>
<td></td>
</tr>
<tr>
<td>Sub-Contractor(s) Representative(s)</td>
<td>Attend / Review</td>
<td>x</td>
<td></td>
<td></td>
<td>...if needed to provide specific knowledge of task details, hazards or controls - or possible interactions with other work groups</td>
</tr>
<tr>
<td>Equipment Operator(s)</td>
<td>Be Considered</td>
<td>x</td>
<td></td>
<td></td>
<td>...if needed to provide specific knowledge of task details, hazards or controls - or possible interactions with other work groups</td>
</tr>
<tr>
<td>Manufacturer’s Rep (OEM Tech Rep, etc...)</td>
<td>Be Considered</td>
<td>x</td>
<td></td>
<td></td>
<td>...for applicable items</td>
</tr>
</tbody>
</table>

**Attend:** this individual must be present during the meeting or send an authorized designate. The meeting is not to proceed without this individual.

**Attend/Review:** it is recommended that these individuals be present during the meeting. If not, these individuals should review the PHR Minutes and provide feedback to the Facilitator.

**Be Considered:** these individuals should be invited as applicable to the specifics of the work

**Invited:** these individuals must be invited to the PHR Meeting. They can accept, send a designate, decline. The meeting will proceed regardless of the attendance.
### PHR Preparation Checklist (Optional)

<table>
<thead>
<tr>
<th>PHR Preparation</th>
<th>Done</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vale Rep to review Pre-Mobilization Checklist with Contractor Representative(s)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHR Meeting Attendees identified as per the PHR Attendees tab</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vale Rep to obtain copies of and either reference or attach to PHR Methodology tab: SHE Review, FEL/Design PHR, Constructability Review, Scope of Work, Contract Requirements, Drawings, P&amp;ID's, WAH Risk Assessment, Contract Specific Safety Plan, previous PHRs for the work, Commissioning Documents, Maintenance Planning package, etc…</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vale Rep to review Design PHR to bring forward any construction hazards identified during Design PHR to Construction PHR (or Construction PHR to Commissioning PHR)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sequence of work tasks or the description of equipment / process completed on PHR Methodology tab</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meeting Invitation issued by Vale Rep (with supporting documents)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vale Rep to confirm all required attendees have accepted</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vale Rep to ensure all invitees are familiar with the work site (if req'd, arrange site visit as part of the PHR Meeting)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHR Facilitator has been identified</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scribe (minutes taker) has been identified</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If there will be commissioning requirements, Vale Rep to initiate a separate Commissioning PHR Meeting</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### PHR Template Check

- All PHR heading information is completed and correct
- All supporting documents are attached or referenced on the Methodology tab
- An overview of the scope has been entered on the Methodology tab
- A Methodology or List of Processes/Materials has been entered on the Methodology tab
- The Hazards Checklist has been reviewed and the appropriate hazard classes have been marked with an "X"
- The EVENTs listed are clear "What If" statements
- The HAZARD CLASSes listed on the Minutes tab align with those identified on the Hazard Checklist
- The EXISTING PROTECTIONs listed identify only existing protection currently in place by Vale and/or the Contractor (with document title & number, or specific details to a level appropriate for the hazard)
- The ACTIONs listed are only new or additional controls that will be put in place to mitigate the hazard and are phrased as action statements
- All ACTIONs identified have an individuals name and Company/Department listed
- Each line on the Minutes tab has the appropriate Review Group identified with an "X"
### PHR Meeting

If the Contractor/Consultant has pre-populated the PHR, the Vale Rep is to review the document prior to the PHR Meeting to ensure the above PHR Template Checks are complete.

- Facilitator to provide meeting handouts:
  - sign in sheet
  - print and provide copies of PHR Hazard Checklist Triggers
  - copies of Methodology / list of processes & materials

- Vale Rep to ensure all required meeting attendees are present (if not, reschedule meeting)

- Facilitator to review project background (Scope of Work and battery limits, Contract Specific Requirements)

- Facilitator to review Methodology

- Facilitator to review any supporting documents, if applicable

- Facilitator to review PHR Hazards Checklist, Scribe to update based on group input

- Facilitator to identify the process for PHR Minutes review/completion and reviews the intent of each column on the PHR Minutes tab

- Vale Rep to ensure any construction hazards identified on Design PHR are brought forward to the Construction PHR; or any commissioning hazards identified during Design

- Vale Rep to facilitate PHR:
  - to ensure the identified Vale PHR Meeting Process is followed, as identified above
  - to ensure the meeting continues to flow by intervening during lengthy discussions or by providing a "parking-lot" for topics that require further time for discussion

- Vale Rep to ensure all PHR Checks above are complete before ending the PHR Meeting

### Post PHR Meeting

- Scribe to complete PHR as per the PHR Template Checks identified above, if not already completed during the PHR Meeting

- Vale Rep to issue PHR to Invitees/Attendees (including those that did not attend the meeting where their review of the PHR is req'd)

- Vale Rep to ensure that all Invitees that did not attend the PHR, but are required to review the PHR have done so and adjust the PHR as per their feedback, where appropriate

- Vale Rep to issue the updated PHR to all Invitees/Attendees, as needed

- Vale Rep to file PHR according to local document management standards for the area

- Vale Rep to obtain Worker Sign Off Sheet and attach to source PHR file

- Vale Rep to ensure all PHR related items on the Pre-Mobilization Checklist are complete

- Vale Rep to audit to ensure all PHR action items are complete (optional tab)

If any MOC has been triggered by this PHR has the proper MOC Process been started
Overview of Scope:
Re-roof the garage at Lot 52 due to extensive weather damage. Strip and replace all shingles. Inspect and replace plywood roof sheathing as required. Dispose of all scrap materials at city landfill. Clean up site. Inspect with owners before demobilization.

List Methodology
* For Construction, Service Work, Maintenance or Commissioning PHR's list the tasks in the sequence they will be done, including major equipment, tie-ins, unusual circumstances and any unusual hazardous materials

1. Identify fall arrest anchor points and install anchors. Install ladder ties - fasten them to the building
2. Ensure ground area is roped off and clean of debris. Ladder access points and trailer site.
3. Locate a dump-trailer close to side wall such that old roofing materials can be deposited from roof surface
4. Remove old shingles and check roof integrity - throw the old shingles/nails in the trailer.
5. Replacing sheathing as required, throw the old plywood and other scrap in the trailer.
6. Have new shingles delivered and lifted to the roof using a Boom-truck
7. Have other material and tools brought to the roof in a pouch, or lifted by rope / pail / Ginwheel, etc - no ladder-climbing w/ materials.
8. Install first row of shingles at bottom edge of roof. (Tie off using robe-grabs - )
9. Continue with subsequent rows adjusting the fall arrest as required. (Have labor helper bring bundles of shingles to installing individual to limit the need to kneel and stand repetitively)
10. Install ridge cap
11. Remove all material and tools from the roof
12. Clean up the site
13. Deliver all scrap to City landfill
14. Inspect site with owner
15. De-mobilize
16.
Hazard Checklist

<table>
<thead>
<tr>
<th>Hazard Class</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASPHYXIATION</td>
<td></td>
</tr>
<tr>
<td>FALL OF MATERIALS</td>
<td>x</td>
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<tr>
<td>MOBILE EQUIP./VEHICLE</td>
<td>x</td>
</tr>
<tr>
<td>COMMUNICATION</td>
<td>x</td>
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<tr>
<td>FIRE</td>
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<tr>
<td>NOISE</td>
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<tr>
<td>CONFINED SPACE</td>
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<tr>
<td>HAZARDOUS MATERIALS</td>
<td></td>
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<tr>
<td>PERSONAL INJURY</td>
<td>x</td>
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<tr>
<td>CORROSION</td>
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<tr>
<td>HOT / COLD</td>
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<td>PROCESS CHANGES</td>
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<tr>
<td>DUST</td>
<td>x</td>
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<tr>
<td>HOT METAL</td>
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<td>RADIATION</td>
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<tr>
<td>ELECTROCUTION</td>
<td>x</td>
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<tr>
<td>HOUSEKEEPING</td>
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<tr>
<td>SITE CONDITIONS</td>
<td>x</td>
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<tr>
<td>EMERGENCIES</td>
<td>x</td>
</tr>
<tr>
<td>HUMAN FACTOR</td>
<td>x</td>
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<tr>
<td>UTILITIES FAILURE</td>
<td>x</td>
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<tr>
<td>ENERGY SOURCES (ZES)</td>
<td>x</td>
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<tr>
<td>HYGIENE</td>
<td>x</td>
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<tr>
<td>WATER</td>
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<tr>
<td>ENVIRO. IMPACT</td>
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<tr>
<td>LOGIC SYSTEMS</td>
<td></td>
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<tr>
<td>WEATHER</td>
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<tr>
<td>ERGONOMICS</td>
<td>x</td>
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<tr>
<td>LOSS OF CONTROL</td>
<td>x</td>
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<tr>
<td>WORKING AT HEIGHTS</td>
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<tr>
<td>EXPLOSION</td>
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<tr>
<td>MECHANICAL FAILURE</td>
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</tbody>
</table>
Refer to the PMO Extranet Site for Vale Programs, Policy's, SPIs to identify existing Vale prev

extportal.vale.com

ASPHYXIATION

Consider the following ASPHYXIATION Hazards:
* Exhaust from combustion engines either identified or not identified in the area
* Intake air exchange units bringing in toxic fumes or vapors
* Poor air quality
* Confined space not identified

Consider the following ASPHYXIATION Mitigation:
* Confined spaces work permit required
* Air Quality checks
* Review Policy & Procedure for Confined Spaces (consider this as a main hazard)
* Identification
* Training Emergency preparedness
* Recirculation / redirection of UG ventilation
* UG Equipment ventilation requirements

COMMUNICATION

Consider the following COMMUNICATION hazards:
* Line of sight / No line of sight communication
* Working alone
* Cross Shift Communication (lack of, or mis-communication)
* Language Barriers
* Hearing Impairment (hearing loss/damage, and/or high noise levels)
* Literacy Impairment
* Radio Frequency Interference / Radio System failure
* Visual Impairment (Color Blindness or acuity, and/or poor lighting, smoke/dust/fog or other workplace
* Cross Boundary Issues (interdepartmental, etc...)

Consider the following COMMUNICATION Mitigation:
* Golden Rule #10 - Management of Change: Always conduct a management of change assessment before implementing any temporary or permanent change (process, equipment, or facility).
* Back up communication
* Notification to other work groups of critical tasks.
* Underground mine Ramp Protocols
* Emergency notifications
* Hoisting / tramming signals
* Record of Impairment (Safety and Emergency Systems)
* Transportation Permit for working near Rail Lines
* Road / Walkway Closure

CONFINED SPACE

See Asphyxiation

Consider the following CONFINED SPACE Hazards:
* Recognition of the area to determine whether or not it is a confined space

Consider the following CONFINED SPACE Mitigation:
* Golden Rule #6 - Confined Spaces: Only enter a confined space if you are trained, qualified and
* Coordination form, air testing, rescue plan, confined space registry
* Training / qualification
* Meet both conditions of a Confined Space (Human Occupancy & Potential Hazardous Atmospheric
### CORROSION

**Consider the following CORROSION Hazards:**

**Items Affected by Corrosion:**
- Structural Steel / Platforms / Grating
- Machinery Guards
- Piping / Vessels
- Ground Supports / Anchors (Surface and Underground)
- Slings / Rigging / Hoist Cables
- Equipment / Vehicles

**Sources of Corrosion:**
- Water
- Chemicals and Process Materials (Acids / Bases)
- Dissimilar Metals (Galvanic Corrosion)

**Consider the following CORROSION Mitigation:**
- Golden Rule #9 - Chemicals and Hazardous Substances: Only handle hazardous substances in
- Pre-use inspections (rigging equipment, structural components, electrical wiring / connections, piping /)
- Scheduled PM inspections
- Protective coatings (paint, rubberizing, plasticizing, galvanizing, etc)

### DUST

**Consider the following DUST Hazards:**
- Shotcrete spraying
- Mixing of shotcrete / concrete
- Removal of existing infrastructure (dust accumulation)

**Consider the following DUST Mitigation:**
- Golden Rule #9 - Chemicals and Hazardous Substances: Only handle hazardous substances in
- Communicate Respiratory requirements (signage, procedures / protocols, training, personal contacts,
- Improved Ventilation (general increase for dilution of contaminants, and/or targeted ventilation for wor
- Dust Control (water sprays, prewashing, dust suppression agents, etc.)
- PPE & qualifications

### ELECTROCUTION

**Consider the following ELECTROCUTION Hazards:**
- Multiple power sources
- Contact with Overhead Power lines
- Lightning
- Improper verification of Zero Energy State due to process interlock, safety interlock, etc
- Water coming into contact with electrical equipment (rain, pressure washing, piping leak / failure, flood

**Consider the following ELECTROCUTION Mitigation:**
- Golden Rule #4 - Energy and Equipment Isolation: Only work on equipment if all energy sources have been identified, tagged, locked with your personal lock and tested to ensure they are at zero energy sta
- Tagging, Locking and testing - ZES
- Switch Room Access rules
- Be aware of open / exposed busbar
- Wear nonmetallic ear muffs on head protection
- Utility locates
- Specialized PPE
- Use of GFCI's when working in wet areas, or when using a portable generator

Also refer to ENERGY SOURCES (ZES) Hazards and Mitigation
### EMERGENCIES

**Consider the following EMERGENCIES Hazards:**

- Failure in communication systems – horn, P.A. warning lights
- Chaos amongst individuals (human response factor) - panic
- Misdirection of emergency services
- Unfamiliar with location identification
- Complacencies due to false alarms or assumption of test procedure
- Increase of mobile equipment for services
- Cross Boundary Issues (locations of INVAC/OUTVAC, Emergency Preparedness Planning)

**Consider the following EMERGENCIES Mitigation:**

- Identify locations of INVAC & OUTVAC lo / Fire Evacuation Sites / Safe Assembly areas (refer to Plan)
- Identify location of Fire Fighting Equipment
- Fire Procedures (see underground or surface procedures)
- Review Emergency lights / audible alarms with all personnel
- Communication of Reporting Procedures

### ENERGY SOURCES (ZES)

**Consider the following ENERGY SOURCES Hazards:**

- Piping - Air/Water/Acid/Fuel/Oxygen etc...
- Electricity
- Power sources fed from multiple locations
- Charged Circuits
  - Sneak Circuits (electrical/piping/process/controls etc...)
- Hydraulics
- Suspended Loads (Cylinders, Gates, Counter Weights etc...)
- Spring Energy
- Rigging under tension
- Accumulators (Hydraulics, Air, Process Gas etc...)
- Off Center Loads (Also consider under Loss of Control)
- Magnetic Devices
  - Isolation of systems / equipment that could affect the Health & Safety of other workers (e.g. elevators, production hoists, fire protection systems, emergency equipment, etc.)
  - Cross Boundary Issues (Sources of engineering/flow, impact on operating areas)

**Consider the following ENERGY SOURCES Mitigation:**

- Golden Rule #4 - Energy and Equipment Isolation: Only work on equipment if all energy sources have been identified, tagged, locked with your personal lock and tested to ensure they are at zero energy state
- Check Tagging Lists against process drawings or P&ID’s, and inspect field isolation devices and locks
- Trace cables/pipes to source - Isolate/test/apply ZES procedure.

Also refer to ELECTROCUTION Hazards and Mitigation
**ENVIRONMENTAL IMPACT**

Consider the following ENVIRONMENTAL IMPACT Hazards:

- **Fugitive Dust**
- Spills to soil, air and/or water
- Trackout
- **Designated Substances:**
  - Lead, Silica, Asbestos, Isocyanates, Arsenic, Mercury, Benzene
- Impact on Water Treatment Facilities
- Impact on surface/groundwater
- Soil Contamination
- Regulatory or permitting issues
- Odor Discharge
- Noise/Vibration impact on community
- Property Damage

Consider the following ENVIRONMENTAL IMPACT Mitigation:

- **Golden Rule #9 - Chemicals and Hazardous Substances:** Only handle hazardous substances in
- **Housekeeping as you go (at least daily)**
- **Segregated debris:** domestic, industrial, steel
- **Reduce, Reuse, Recycle**
- **Proper Disposal of Excavated Materials, Consumables**
- Waste Management
- **Procedures to contain dust / fume / liquids / trackout material / noise that could impact the environment or adjoining properties**

**ERGONOMICS**

Consider the following ERGONOMICS Hazards:

- **Musculo-Skeletal Disorders (MSD) or other injuries caused by lifting or moving material**
- **Hand-Arm Vibration Syndrome (HAVS) or other issues caused by exposure to Vibrating equipment**

Consider the following ERGONOMICS Mitigation:

- **Golden Rule #5 Lifting and Mechanical Handling:** Always use authorized, maintained appropriate and certified lifting devices capable of lifting a load in a controlled manner and safeguard against
- **Training in proper manual material handling techniques**
- **Mechanical assistive devices (forklift, pallet jack, lifting/rigging equipment, etc)**
- **Proper positioning of valves and controls for ease of access by workers**
- **Review of the site / tasks by an Ergonomist or other knowledgeable person**
- **Anti-fatigue mats**
- **Anti-vibration gloves (PPE)**

**EXPLOSION**

Consider the following EXPLOSION Hazards:

- **Volatile Reagents (fumes)**
- **Compressed Gas Cylinders (SAF SPI 15)**
- **Flammable Liquids and Gases (SAF SPI 13)**
- Tanks and enclosed spaces
- Blasting operations
- Remnants of blasting agents (Old Sites)
- Piping (e.g. High Pressure Oxygen, Natural Gas, Nickel Carbonyl, Xanthate)

Consider the following EXPLOSION Mitigation:

- **Golden Rule #4 - Energy and Equipment Isolation:** Only work on equipment if all energy sources have been identified, tagged, locked with your personal lock and tested to ensure they are at zero energy state
- Work Permits
- Access Restrictions (Restricted areas)
### FALL OF MATERIALS

**Consider the following FALL OF MATERIAL Hazards:**
- Draw points, Ore passes & Shafts.
- Condition of existing UG Ground Support
- Rigging / lifting devices
- * working overhead / multiple horizons

**Consider the following FALL OF MATERIAL Mitigation:**
- Barricade off area above and below
- Kick plates on staging, tethered tools etc.
- Tie off tools where applicable.
- Post signs

### FIRE

**Consider the following FIRE Hazards:**
- Welding & Cutting
- Heat / Spark Generating Tools / Equipment
- Oxygen Enrichment Levels
- Rubber Lined Piping / Tanks / Equipment
- Smoking

**Consider the following FIRE Mitigation:**
- Golden Rule #9 - Chemicals and Hazardous Substances: Only handle hazardous substances in
- Hot Work Permits
- Plant Policies for Designated / Restricted Areas
- Surface / Underground Fire Procedures
- Fire Watch personnel
- * Fire Prevention Equipment (fire blankets, dry chemical extinguishers, process water, hydrants)

**Consider the following FIRE Mitigation:**
- Hollis (Note: do not use the fire hoses in fire hose cabinets - they are restricted to Authorized firefighting personnel)
- Surface / Underground Fire Procedures
- Fire Watch personnel

### HAZARDOUS MATERIALS (incl. TOXICITY)

**Consider the following HAZARDOUS MATERIALS hazards:**
- Exposure to Designated Substances or other Hazardous Materials (lack of identification, or improper handling)
- Restricted Materials on Vale Site
- Fumes
- Field Burning
- Cutting & Welding (Respiratory Protection / Smoke Eaters)
- Chemical reactions

**Consider the following HAZARDOUS MATERIALS Mitigation:**
- Golden Rule #9 - Chemicals and Hazardous Substances: Only handle hazardous substances in
- Consult the Vale Occupational Health representative for the area
- MSDS for all materials on site
- MSDS readily accessible
- WHMIS Labels
- Current Training
- Proper Disposal
- Safe Handling Practices
- Transportation of Dangerous Goods
- Waste Manifests
- Proper Storage of Hazardous Materials
- PPE
**HOT / COLD Hazards:**

- Extreme change in weather
- Explosion of gases or materials
- Exposure to Propane, Liquid Oxygen, Dry Ice (CO2) or other sub-cooled gases or materials
- HOT Operating processes in the area (Hot Metal Operations, other processes that generate heat, etc)
- COLD Operating processes in the area (Oxygen Plant Operations, other processes that create very cold conditions)

**HOT / COLD Mitigation:**

- Heat Stress / Cold Stress Procedures
- Wet bulb temperature measurements for work / rest regimes (Heat Stress)
- Dress appropriate for the temperature and working conditions
- Training in equipment operation / materials handling procedures for items that generate HOT or Cold
- PPE

**HEAT STRESS Hazards:**

- High air temp (above 27 degrees Celsius)
- The work rate is high and/or usually results in workers sweating
- Radiant heat sources and/or high humidity are present
- Air flow in the work area feels warm or hot instead of cool
- Heavier clothing, vapour barrier clothing, or multiple layers are required
- Cases of heat illness have been reported

**HEAT STRESS Controls:**

- Consult with the Vale Occupational Health / Safety Specialist
- Establish “triggers” to put a Heat Stress Response plan into effect
- Provide means of measuring air temperature, humidity, air flow and radiant heat (where applicable)
- Heat Stress Response plans may include cooling off stations, work/rest regimens / self-pacing, access to cool drinking water, changes in procedures and/or PPE used, emergency response plans, etc...
- Training & instructions for workers
- Management of workers with medical restrictions re: Heat Stress exposure
- Refer to the MOL Heat Stress Guideline

**COLD STRESS Hazards:**

- Low air temp (below -20 degrees Celsius)
- The work rate is high and/or usually results in workers sweating
- Sub-cooled surfaces are present (e.g. Oxygen Plant Cold Box, Ammonia tanks/piping, etc...)
- High Air flow rates are present and low temp. / wet conditions
- Heavier clothing, vapour barrier clothing, or multiple layers are required
- Cases of cold stress have been reported

**COLD STRESS Controls:**

- Consult with the Vale Occupational Health / Safety Specialist
- Establish “triggers” to put a Cold Stress Response plan into effect
- Provide means of measuring air temperature, humidity, air flow and contact surface temperatures (where applicable)
- Cold Stress Response plans may include warming stations, work/rest regimens / self-pacing, access to hot drinks, changes in procedures and/or PPE used, emergency response plans, etc...
- Training & instructions for workers
- Management of workers with medical restrictions re: Cold Stress exposure
- Refer to the applicable guidelines
<table>
<thead>
<tr>
<th>HOT METAL</th>
<th>Consider the following HOT METAL Hazards:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>* Exposure to hot metal (cut-out or spill from slag pot / matte ladle / furnace / converter / etc)</td>
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<td></td>
<td>* Use of water around hot metal</td>
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<td>* Use of pressurized cylinders around hot metal (spray cans, oxy-acetylene torch buggies, propane)</td>
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<tr>
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<td>Consider the following HOT METAL Mitigation:</td>
</tr>
<tr>
<td></td>
<td>* Rope off &amp; tag area BELOW</td>
</tr>
<tr>
<td></td>
<td>* Site Specific Hot Metal Procedures</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HOUSEKEEPING</th>
<th>Consider the following HOUSEKEEPING Hazards:</th>
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</thead>
<tbody>
<tr>
<td>x</td>
<td>* Trips and Falls</td>
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<tr>
<td>x</td>
<td>* Improper disposal</td>
</tr>
<tr>
<td>x</td>
<td>* Accumulation of waste</td>
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<td>x</td>
<td>* Unorganized storage</td>
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<td>x</td>
<td>Consider the following HOUSEKEEPING Mitigation:</td>
</tr>
<tr>
<td>x</td>
<td>* Laydown areas</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HUMAN FACTORS</th>
<th>Consider the following HUMAN FACTORS Hazards:</th>
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<tbody>
<tr>
<td>x</td>
<td>* New or Young Worker</td>
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<tr>
<td>x</td>
<td>* Lack of experience with the specific task to be done</td>
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<tr>
<td>x</td>
<td>* New to the specific workplace / environment / equipment</td>
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<tr>
<td>x</td>
<td>* Unfit for duty - physical illness, mental illness, intoxicated, under the influence of drugs or alcohol, non</td>
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<tr>
<td>x</td>
<td>Cross Boundary Issues (unfamiliarity, lack of established working relationships)</td>
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<tr>
<td>x</td>
<td>Consider the following HUMAN FACTORS Mitigation:</td>
</tr>
<tr>
<td>x</td>
<td>* Work Permits</td>
</tr>
<tr>
<td>x</td>
<td>* Site specific orientation and emergency response orientation</td>
</tr>
<tr>
<td>x</td>
<td>* Medical clearance (Crane Operators, Hoistmen, etc)</td>
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<tr>
<td>x</td>
<td>* Close personal interaction/conversations with each worker</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HYGIENE</th>
<th>Consider the following HYGIENE Hazards:</th>
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<tbody>
<tr>
<td>x</td>
<td>* Skin contact or ingestion of hazardous / toxic materials</td>
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<td></td>
<td>* Lack of hygiene facilities</td>
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<tr>
<td></td>
<td>* Transportation of human waste</td>
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<tr>
<td>x</td>
<td>Consider the following HYGIENE Mitigation:</td>
</tr>
<tr>
<td></td>
<td>* Golden Rule #9 - Chemicals and Hazardous Substances: Only handle hazardous substances in</td>
</tr>
<tr>
<td></td>
<td>* Location of Refuge Stations / Latrines</td>
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<tr>
<td>x</td>
<td>* Hand washing facilities bathroom, shower/dry, lunchroom change room prior to eating etc.</td>
</tr>
<tr>
<td></td>
<td>* Note: Provision of appropriate Hygiene facilities for Contractor Personnel is now mandatory at Vale sit (consider what work is being done and in what work environment)</td>
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<tr>
<td>x</td>
<td>* Bodily Fluids / Biohazards (blood, vomit, excrement) - Identification and Procedures for cleanup,</td>
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<td></td>
<td>* Consult the Vale Occupational Health representative for the area</td>
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<tr>
<td></td>
<td>* Training Receipt for Worker Sign Off of &quot;Contractor Hygiene and Dry Availability Review&quot;</td>
</tr>
</tbody>
</table>
### LOGIC SYSTEMS

**Consider the following LOGIC SYSTEMS Hazards:**

- Auto, Remote & Local operation of equipment.
- Multiple Power feeds
- PLC / DCS Programming errors
- Cross Boundary Issues (Sources of engineering/flow, impact on operating areas)

**Consider the following LOGIC SYSTEMS Mitigation:**

- Golden Rule #4 - Energy and Equipment Isolation: Only work on equipment if all energy sources have been identified, tagged, locked with your personal lock and tested to ensure they are at zero energy state.
- Formal PHA (HAZOP/HAZN/Other) - review of process and safety interlocks etc that could prevent.
- Input / Output testing
- Interlock design checks

### LOSS OF CONTROL

**Consider the following LOSS OF CONTROL Hazards:**

- Hoisting Operations
- Run of Muck / Materials
- Improper Storage of Materials
- Unsupported Ground
- Trenching and Excavation
- Dam Failure
- De-energizing / Re-Energizing of Equipment/Systems
- Mobile equipment
- PLC malfunctions / communication
- Hand Tools / Power Tools
- Human Error / Communications / Unauthorized Access
- Mechanical Failure
- Swing Loads
- Interaction of any new components with existing components

**Consider the following LOSS OF CONTROL Mitigation:**

- Pre-use inspections (rigging equipment, structural components, electrical wiring / connections, piping)
- Scheduled PM inspections
- Training on proper use of equipment
- Access restrictions
- Equipment use limitations

### MECHANICAL FAILURE

**Consider the following MECHANICAL FAILURE Hazards:**

- Hoisting Operations
- Heavy Equipment
- Hydraulic / Pneumatic failures
- Brake / Motor Failure (Manual and Emergency)

**Consider the following MECHANICAL FAILURE Mitigation:**

- Golden Rule #5 Lifting and Mechanical Handling: Always use authorized, maintained appropriate and certified lifting devices capable of lifting a load in a controlled manner and safeguard against.
- Golden Rule #8 - Equipment Safeguarding: Only trained and qualified personnel may alter equipment.
- Load lift tests
- Equipment usage according to design / manufacture instructions
## MOBILE EQUIP./VEHICLES

Consider the following MOBILE EQUIP / VEHICLES Hazards:

- **Contact with Overhead wires**
- **Personnel or process equipment Struck by Mobile Equipment**
- **Brake failure**
- **Right of Way (failure to observe Right of Way) (Crosswalks)**
- **Lack of Training / Qualifications**
- **Distractions (Use of mobile devices, multiple signalers, other alarms/horns/warning lights, etc)**
- **Lack of visibility**
- **Slips / falls while Mounting / Dismounting**

Consider the following MOBILE EQUIP / VEHICLES Mitigation:

- **Golden Rule #3 - Mobile Equipment and Light Vehicles**: Always use mobile equip. and light vehicles for the purpose they were designed for and adhere to site pedestrian / vehicle traffic rules.
- **Golden Rule #8 - Equipment Safeguarding**: Only trained and qualified personnel may alter equipment.
- **General Training & Qualifications** and **Equipment-Specific Training & Instructions**
- **Use of proper travel ways**
- **Underground Mine Ramp Protocols**
- **Traffic Control / Management Plans (Notification of Impairment required for interruption to roadways, Cell phone policy**
- **Hi-Visibility Clothing / Specialized PPE**
- **Transportation Work Permit for working near Rail Lines**
- **Backup warning system**
- **Wheel Chocks**
- **Pre-use Checklist / Equipment PM Inspections**
- **Danger signs at all access points**
- **Rescue Plan (SPI SAF-6 and Reg. 213/91 26.1(4))**
- **Contract Specific Working at Heights Plan**

Also refer to SITE CONDITIONS and WEATHER for Roadway and Driving hazards

## NOISE

Consider the following NOISE Hazards:

- **Noise generated by the work being performed**
- **Noise generated by process equipment or by other work being performed in the area by other personnel**
- **Intermittent high noise levels - back up alarms, horns and sirens**

Consider the following NOISE Mitigation:

- **Hearing protection posted**
- **Certain plants mandatory**
- **Double Protection (plugs & muffs) as required per MOL guidelines**
- **Equipment silencers / mufflers**
- **Location of noise generating equipment**
- **Engineering controls**
**PERSONAL INJURY**

Consider the following PERSONAL INJURY Mitigation:

- **Golden Rule #1 - Basic Requirements:** Only perform work that you are trained, qualified, authorized and authorized.
- **Engineering controls (guardrails, machinery guards, over-pressure protection, fail-safe actuators, bulkheads / head-covers, lightning rods, grounding & bonding systems, equipment / process monitoring**
- **Site orientation and training where required**
- **Special procedures where required (area-specific, task-specific, or project-specific)**
- **Work permits where required**
- **PPE / mandatory safety protection (See Vale SPI's for foot, eye, ear, head, hands, striped / Hi-Vis**
- **Full-body harnesses and fall protection equipment where required**
- **Hearing Protection mandatory, double hearing protection where posted**
- **Full-face Respirators in extremely dusty areas (improved eye protection and respiratory protection)**
- **Vistamax goggles with safety glasses as required**
- **Visors with Safety glasses for grinding & Cutting, overhead work etc...**
- **Specialized PPE (shotcrete, arc flash, acid-resistant suits, etc...)**
- **Identify and remove all tripping hazards / Proper Housekeeping**
- **Guarding of moving / rotating equipment, etc**
- **Standard Cutting Tools (reference SPI SAF-38)**

**PROCESS CHANGES**

Consider the following PROCESS CHANGE Hazards:

- **change in temperature (increase / decrease)**
- **change in pressure or flow (increase / decrease / stoppage)**
- **change in density / current / voltage / speed / rate (increase / decrease)**
- **Impacts on operating parameters of the process? (run time, filtration times, batch treatment times, pH change to other parameters**
- **Impacts on quality or quantity of final product or intermediate products**
- **Impacts on waste streams / by-products**
- **New intermediate products or waste streams created**
- **New impurities introduced into the process**
- **New processing bottlenecks**
- **Cross Boundary Issues (Sources of engineering/flow, impact on operating areas)**

Consider the following PROCESS CHANGE Mitigation:

- **MOC Process**
- **HAZOP**
- **Operability Review**
- **Process control changes (impurities removal, new process parameters: temp, pressure, reagents etc)**
- **New assays / inspections to monitor the process**

**RADIATION**

Consider the following RADIATION Hazards:

- **Density Meters (Other Instrumentation)**
- **Arc Welding**
- **Non Destructive Testing (NDE)**
- **Nuclear Scales**

Consider the following RADIATION Mitigation:

- **Golden Rule #9 - Chemicals and Hazardous Substances: Only handle hazardous substances in**
- **Contact the local Vale Radiation Safety Officer**
### SITE CONDITIONS

Consider the following SITE CONDITIONS Hazards:

- * Roadway Width
- * Pedestrian traffic controls / Reversing Equipment
- * Housekeeping
- * Walking conditions (pathways, slopes, tripping hazards)
- * Ground Control (underground areas - Back, screen, etc.)
- * Material and waste management
- * Roped off areas (see protocol)

Consider the following SITE CONDITIONS Mitigation:

- * Golden Rule #7 - Surface and underground Mining: Only enter areas you are authorized to do so.
- * Signage
- * Sight lines - Walkways
- * Sight lines - Roadways (brush, trees, high banks, buildings, snow banks, curves, etc.)
- * Road Conditions (wet, muddy, dressing required, visibility)
- * Road Soil Stability - Flooding / Erosion / Wash-out / Berm requirements
- * Roadway Haulage Capacity (heavy loads)

### UTILITIES FAILURE

Consider the following UTILITIES FAILURE Hazards:

- * Power Outage (leave building and proceed to Assembly Area)
- * Loss of Air for Pneumatic systems
- * Loss of Compressed Air
  - Loss of ventilation
  - Loss of process water
  - Natural Gas
  - Steam
  - Oxygen
  - Failure to recognize Record of Impairment

Consider the following UTILITIES FAILURE Mitigation:

- * Golden Rule #4 - Energy and Equipment Isolation: Only work on equipment if all energy sources have been identified, tagged, locked with your personal lock and tested to ensure they are at zero energy state
  - Flashlights, etc.
  - Breathing air
  - Stench
### WATER

**Consider the following WATER Hazards:**

- * Slippery areas
- * Process leaks / overflow from sumps
- * Plant/mine water may not be potable water (drink bottled water only)
- * UG water management - Water in / near orepass
- * Flooding
- * Water around Hot Metal
- * Water around Electricity
- * Working around water / ice (drowning hazard)
  - Impounded water
  - Dams (Procedure)
  - Exposure to contaminated water
  - Electrical tools / equip. on floor (floor washing)

**Consider the following WATER Mitigation:**

- Clearing drain holes underground

### WEATHER

**Consider the following WEATHER Hazards:**

- * Cold
- * Heat
- * Wet Conditions
- * Flooding
- * High Winds (hoisting / lifting, working from heights)
- * Lightning / Electrical Storms
  - Snow / Ice (Slips and falls, MSD’s when shoveling etc., access & egress issues)
  - Ice formation on overhead structures
  - Frost (drag brakes on equipment)
- * Driving hazards / reduced visibility (fog, blowing snow, heavy rain, freezing rain)

**Consider the following WEATHER Mitigation:**

- Proper hydration with adequate breaks
- Layered clothing – change of clothing
  - Review weather forecasts
**WORKING AT HEIGHTS**

Consider the following FALL FROM HEIGHTS Hazards:

<table>
<thead>
<tr>
<th>x</th>
<th>* Open Holes</th>
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<tbody>
<tr>
<td></td>
<td>* Working over operating machinery / water / on to a hazardous substance</td>
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<td>* Working from equipment (lift equipment, remote operation etc.)</td>
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<td>* Unconsolidated Material used as a platform</td>
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<td>* Inadequate Support of platforms/hand rails</td>
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<td>* Regulation 854 46(3): Every walk way or platform more than 1.5 meters above ground shall be provid</td>
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<td>* Regulation 213/91 26(2): Work at 1.2 meters above ground, if work area is used as a path for a whee</td>
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<td>* Regulation 213/91 233(4): Excavations more than 2.4 meters deep</td>
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</table>

Also Consider the following SLIP AND TRIP at Heights Hazards:

<table>
<thead>
<tr>
<th>x</th>
<th>* Falls on same level</th>
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<tbody>
<tr>
<td>x</td>
<td>* Mounting and dismounting equipment</td>
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<td>x</td>
<td>* Stairs / Ladders</td>
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<tr>
<td>x</td>
<td>* Ice</td>
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<td>* Uneven ground</td>
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<td>x</td>
<td>* Poor Housekeeping</td>
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</tbody>
</table>

Consider the following FALL FROM HEIGHTS mitigation:

* Golden Rule #2 - Working at Heights: Where there is a hazard of falling 1.8 meters or more, approved maintained and certified equipment for fall protection or fall prevention / travel restraint must be used.

<table>
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<tr>
<th>x</th>
<th>* SPI SAF-6 Fall Protection</th>
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<tbody>
<tr>
<td></td>
<td>* SPI SAF-36 Portable Ladders</td>
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<tr>
<td>x</td>
<td>* Barricades (SPI SAF-18)</td>
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<td>* Solid guardrails</td>
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<td>* Snow fence, road barriers</td>
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<td>x</td>
<td>* Wear full body harness</td>
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<td>x</td>
<td>* Protective coverings</td>
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<td>* Danger signs at all access points</td>
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<td>* Specialized PPE</td>
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<td>* Rescue Plan (SPI SAF-6 and Reg. 213/91 26.1(4))</td>
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<td>* Contract Specific Working at Heights Plan</td>
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<td>* Training and qualifications</td>
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<tr>
<td>Item #</td>
<td>EVENT / ISSUE (What if / Consequences)</td>
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<tr>
<td>1</td>
<td>What if hot exhaust on truck starts a grass fire?</td>
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<td>2</td>
<td>What if smoking causes a fire?</td>
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<tr>
<td>3</td>
<td>What if an electrical short circuit occurs and causes a fire?</td>
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<tr>
<td>4</td>
<td>What if an electrical short circuit occurs and causes a fire?</td>
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</tbody>
</table>
# Workers Sign Off Sheet (PHR)

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<tr>
<th>No.</th>
<th>Print Name</th>
<th>Signature</th>
<th>Company</th>
<th>Date</th>
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</table>

**Project Title:** (enter Project Title / desc of work for non-project work)

**Plant Name:**

**Oracle Plant #:**

**PHR Type:** tt

**PHR Facilitator:**

**Contractor / Consultant / Work Group:**

**Date:**

**Document DM #:**

**Rev #:**

**PO #:**

---

*Project Navigator*

*VALE*

NAV-TP-0019 v19 Page 1 of 1
# HAZOP CONSIDERATIONS (optional)

**Project Title:** (enter Project Title / desc of work for non-project work)

<table>
<thead>
<tr>
<th>Plant Name:</th>
<th>Oracle Plant #:</th>
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<tbody>
<tr>
<td>PHR Type:</td>
<td>Date:</td>
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<tr>
<td>PHR Facilitator:</td>
<td>Document DM#:</td>
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<tr>
<td>Contractor / Consultant / Work Group:</td>
<td>Rev #:</td>
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</table>

**Project #:**

**Work Order #:**

**Eng. Job #:**

**Document DM #:**

**Rev #:**

**PO #:**

**Note:** other tools may be more suitable for documenting a formal HAZARDS and OPERABILITY REVIEW for large-scale process changes.

**HAZOP:** Use this form to help identify the potential consequences of making changes to operating processes, or changes to the operation of specific equipment/systems. Refer to the Engineering HAZOP Guideline (GUID-02001)

<table>
<thead>
<tr>
<th>Item #</th>
<th>Node / Section</th>
<th>Parameter</th>
<th>Deviation</th>
<th>Consequence / Outcome</th>
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</thead>
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<tr>
<td>3</td>
<td>Identify the process</td>
<td>List the parameter being reviewed:</td>
<td>List the deviation in the parameter:</td>
<td>Describe the consequences of the deviation in the listed parameter for that node/section. This will become the “What If” statement in the PHR Minutes tab</td>
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<tr>
<td>4</td>
<td>&quot;Node&quot; or section of piping / electrical / instrument system that is being reviewed</td>
<td>- temperature</td>
<td>- increase</td>
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<td>- pressure</td>
<td>- decrease</td>
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<td>- flow</td>
<td>- sudden stop</td>
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<td>- density</td>
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**NAV-TP-019 v19**

Page 1 of 1
<table>
<thead>
<tr>
<th>Item #</th>
<th>ACTION (Additional Controls Required)</th>
<th>Name</th>
<th>Dept / Co</th>
<th>Audit Result</th>
<th>Comments</th>
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</table>
1. Why Do PHR’s
2. How To Do PHR’s
3. How to Get the Best Results

Recap
PHR’s – Recap

Why Do PHR’s?

– To get to Zero Harm!
  • Don’t hurt people
  • Don’t damage equipment, property, or the environment
  • Don’t cause process delays

– By Managing Risk
  • Identify Hazards
  • Identify Controls
  • Communicate those Hazards & Controls
  • and … Follow up!
What Are PHR’s?

- PHR’s are a Risk Management tool
  - PHR’s help Identify and Manage Risks
  - Along with:
    - Contract-specific Safety Plans
    - Training, Procedures & JHA’s
    - Audits & Inspections
    - Safety Talks, Toolbox Talks, etc…

- PHR’s are also a Due Diligence tool
  - Document Hazards & Controls
    - … and the worker reviews / signoffs
  - *This is NOT their main purpose, though!*
PHR’s – Recap

How Are PHR’s Done?

– Prepare for the meeting
  • Gather the reference materials \textit{(SoW, drawings, photos, etc…)}
  • Prepare a Draft PHR and review with the Vale Rep \textit{(Pre-Screening)}

– Get the right people together \textit{(Attendees)}

– At the PHR Meeting, review
  • What work is being done \textit{(Scope Overview)}
  • How, Where, When and by Who \textit{(Methodology)}
  • The Hazards \textit{(What If … ? )}
  • The Controls that are already in place \textit{(Existing Protection)}
  • What other Controls are needed \textit{(Action Items)}

– Communicate to
  • Workers
  • Other stakeholders
PHR’s – Recap

How Do We Get the Best Results?

– Prepare for the meeting
  • Attendees need to prepare too - review the Pre-Screened PHR & reference materials
  • More than one meeting may be needed for large / complex jobs

– Get the right people together
  • That will work as a team, representing all Stakeholders
  • That understand the Hazards and the Controls for
    – the work,
    – the workplace, and
    – the workers
PHR’s – Recap

How Do We Get the Best Results?  Continued …

– At the PHR Meeting
  • Make sure everyone understands the Scope and Methodology
  • Participate, and encourage others to participate
  • Don’t take over the meeting
  • *If needed, the Facilitator may assign an item to the “Parking Lot”*

– Communicate
  • *Remember who the PHR is for*  
    … those doing the work, and others that could be affected!
  • Use clear, simple wording
  • Avoid acronyms and jargon
  • Focus on the critical items … don’t include the “chickenfeed”
PHR’s – Recap

How Do We Get the Best Results?  Continued …

– Follow Up
  • Make sure Action Items are done
  • A PHR Field Audit form is included in the Template
  • If conditions change, a new / revised PHR may be needed

– NOTE: no two PHR’s are ever EXACTLY the Same
  • The same job done a different day usually has some different hazards
  • A similar job, done in a different place, on a different day, with a different crew may have very different Hazards and Controls
  • Always remember … “It depends on the circumstances”
For a world with new values.