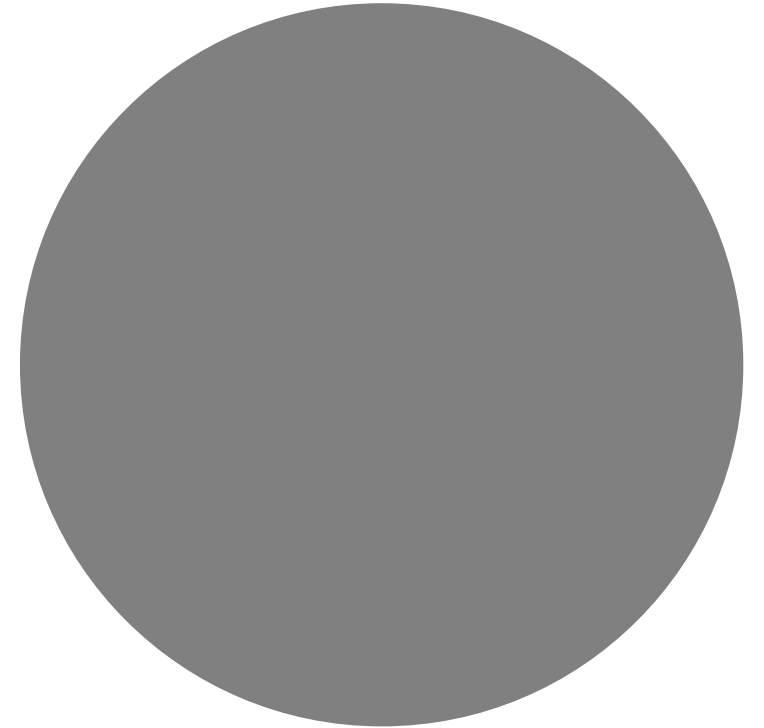


Florida AIHA Local Section

Build A Globally-Applied  
Qualitative Risk Assessment Tool

---

Nancy M. McClellan, M.P.H., CIH, CHMM  
Occupational Health Management, PLLC  
(+1-224-517-2990)



Introductions  
and Session  
Objective

This  
Session  
Will  
Describe:

---

Risk Assessment Purposes,

---

Tool Anatomy,

---

KPI Outcomes,

---

Business Case, and

---

Challenges

---

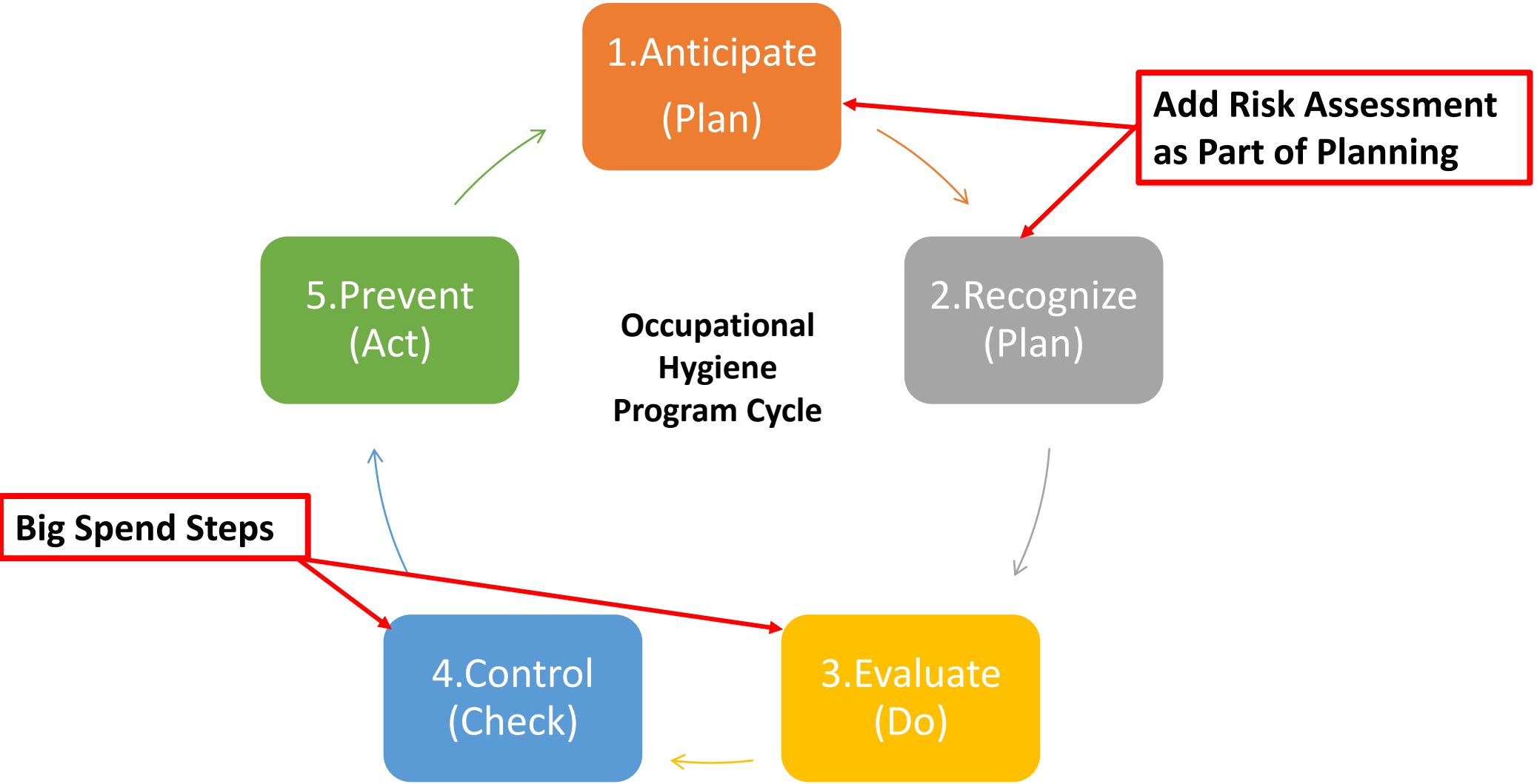
Need: Organized,  
Consistent Means  
of Assessing  
Worker Risk for a  
Large, Global  
Corporation

Solution:  
Software-based  
RA Tools

Tools to qualitatively and  
quantitatively assess and rate  
potential exposure risk to  
hazardous agents

Tools to create a common  
platform means uniformity of  
global reporting and data output

# Placement of a Risk Assessment Process?



Q: Why Bother  
With a Risk  
Assessment  
Process?

A: Focused,  
Efficient, and  
Effective  
Evaluation and  
Control Program



Reveal root causes and other factors  
behind the sampling data



Communication of risk vs. potential  
loss information needed by  
management at site, national and  
global levels



Risk Assessment makes an IH program  
more informative and effective with  
Key Performance Indices for IH

# Anatomy of a Risk Assessment Tool

$$\text{Risk} = \text{Severity} \times \text{Likelihood}$$

## Severity Factors

- Hazard's Toxicity / Health Impact Potential
- Concentration/Intensity of Exposure
- Environmental Conditions
- Worker Health Status

## Likelihood Factors

- Frequency of Exposure
- Duration of Exposure

# Group Exercise

Break up

Break up into groups according to industry or industry interest

Define and record

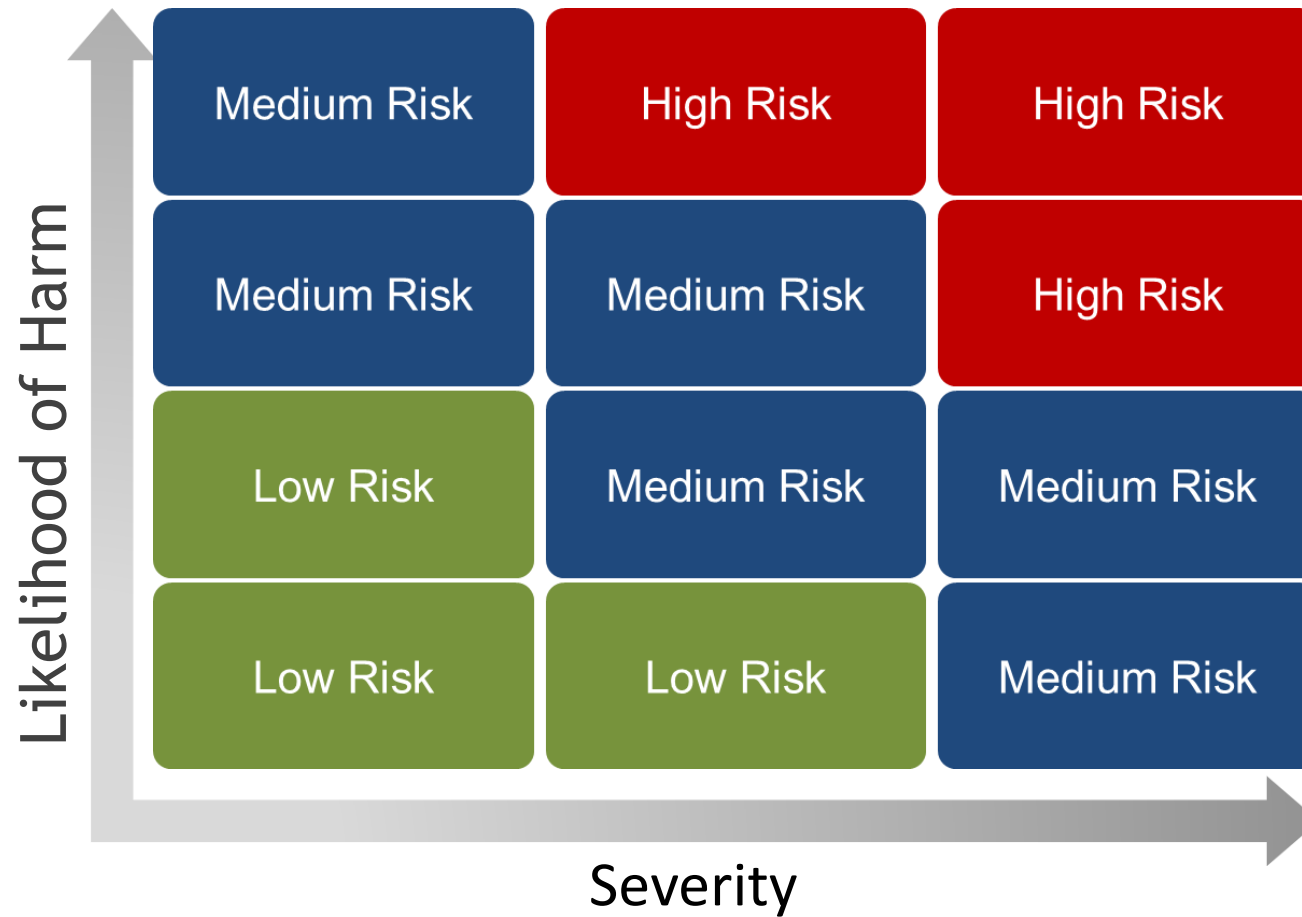
As a team define and record as many hazard **severity** and **likelihood** factors as possible.

Rank

Rank both sets of factors from most important to least important

# Anatomy of a Risk Assessment Tool

$$\text{Risk} = \text{Severity} \times \text{Likelihood}$$





## Example RA Tool – Cement Industry

- Focus is industry-specific: e.g. Cement production plants
- Main risks to be assessed at Cement plants are:
  - Silica
  - Respirable Dust (incl. cement powder)
  - Noise
- Provides risk ratings for 17 possible areas in a Cement plant
- Provides an overview of process materials present at each area to which workers may be exposed, and their silica content (primary concern)
- Assesses worker risk potential based on past exposure measurements and best-judgement (qualitative) of exposure conditions
  - Input is based on observations and informed judgement of variables impacting worker exposure

# Example RA Tool – Cement Industry

## RA Tool Overview

The tool is arranged so that the user completes only 3 steps for each plant area:

### Step 1 – Testing History

+ Provides background of worker exposure levels

### Step 2 – Qualitative Assessment

+ Judgement of risk potential by assessing the following variables:

- Process Materials
- Emission Severity
- Worker Exposure Duration
- Worker Groups Affected
- Existing Controls in Place

### Step 3 – Control Selection

+ Guidance (by the software) to the user on selection of appropriate levels of control based on risk ratings

# Input Elements of the Tool

## Plant Areas, Main RA Input Worksheets

**\*\*These are the core user input sheets in the tool\*\***

Site Occupational Hygiene Qualitative Assessment Form – Cement Plant

Ver. 1.0 / 23-Jun-2018

Developed by: Svend G. Nielsen

See Menu Key on Sheet 2 for material and exposure criteria, as well as descriptions of worker groups and controls



**Step 1: Testing History**

|                                   |  |
|-----------------------------------|--|
| Personal Air Testing Completed?   |  |
| Worker Dust Exposure Levels:      |  |
| Area Noise Mapping Completed?     |  |
| Personal Noise Testing Completed? |  |

|                   |   |
|-------------------|---|
| Site Name:        | (insert name of site, country, region)                    |
| Facility:         | (indicate the part of site being assessed, or whole site) |
| Assessment Dates: | (mm/dd/yyyy)  |
| Conducted By:     | (Name of health & safety person)                          |

**Step 2: Qualitative Assessment**  
Area: Quarry & Crushing Plant

**Insight:** High silica materials may be present here from minor ingredients used to boost silica content in the Raw Mix.

| Process & Work Task Dust Emissions   | Sources/Locations                                      | Type of Material | Crystalline Silica Content of Material | Visible Airborne Dust (rate/severity) | Spillage Cleanup Amounts (rate max./severity) | Maximum Worker Exposure Duration | QA-Assessed Dust Exposure Risk Level  | Worker Groups Affected |             |           |          |                 | Existing Controls        |                              |                            |            |           |        | Notes – Root Causes; Cleanup Methods & Tools Used |                 |                 |  |  |  |
|--|--|------------------|--|---------------------------------------|---|----------------------------------|---------------------------------------|------------------------|-------------|-----------|----------|-----------------|--------------------------|------------------------------|----------------------------|------------|-----------|--------|---|-----------------|-----------------|--|--|--|
|  |  |                  |  |                                       |   |                                  |                                       | Production, Inspectors | Maintenance | Labourers | Vehicles | Other (specify) | Engineering, containment | Engineering, dust collection | Engineering, bulk cleaning | Cab, booth | Work task | Admin. |   | Respiratory PPE | Other (specify) |  |  |  |
| Respirable Crystalline Silica & Respirable Dust -- process & work-task sources | Primary Crusher:                                       | Flow:            |  |                                       |   |                                  |                                       |                        |             |           |          |                 |                          |                              |                            |            |           |        |   |                 |                 |  |  |  |
|  | Silica Crusher:  | Flow:            |  |                                       |   |                                  |                                       |                        |             |           |          |                 |                          |                              |                            |            |           |        |   |                 |                 |  |  |  |
|  | Fine Crushing:   | Flow:            |  |                                       |   |                                  |                                       |                        |             |           |          |                 |                          |                              |                            |            |           |        |   |                 |                 |  |  |  |
|  | Screens:   | Flow:            |  |                                       |   |                                  |                                       |                        |             |           |          |                 |                          |                              |                            |            |           |        |   |                 |                 |  |  |  |
|  | Conveyors, transfer points:                            | Flow:            |  |                                       |   |                                  |                                       |                        |             |           |          |                 |                          |                              |                            |            |           |        |   |                 |                 |  |  |  |
|  | Surge Pile or Bins:                                    | Flow:            |  |                                       |   |                                  |                                       |                        |             |           |          |                 |                          |                              |                            |            |           |        |   |                 |                 |  |  |  |
| Other Dusts -- process or work-task sources                                    | Roads & Yard:  | Flow:            |  |                                       |   |                                  |                                       |                        |             |           |          |                 |                          |                              |                            |            |           |        |   |                 |                 |  |  |  |
|  | Mobile Equipment:                                      | Flow:            |  |                                       |   |                                  |                                       |                        |             |           |          |                 |                          |                              |                            |            |           |        |   |                 |                 |  |  |  |
|  | Other:   | Flow:            |  |                                       |   |                                  |                                       |                        |             |           |          |                 |                          |                              |                            |            |           |        |   |                 |                 |  |  |  |
| Process & Work Task Noise Emissions  |  |                  |  | Process Noise Sources (rate/severity) | Work-Task Noise Sources (rate/severity)       | Maximum Worker Exposure Duration | QA-Assessed Noise Exposure Risk Level | Worker Groups Affected |             |           |          |                 | Existing Controls        |                              |                            |            |           |        | Notes – Root Causes; Work Methods & Tools Used    |                 |                 |  |  |  |
| Noise -- process & work task sources   | Primary Crusher:                                       |                  |  |                                       |   |                                  |                                       |                        |             |           |          |                 |                          |                              |                            |            |           |        |   |                 |                 |  |  |  |
|  | Silica Crusher:  |                  |  |                                       |   |                                  |                                       |                        |             |           |          |                 |                          |                              |                            |            |           |        |   |                 |                 |  |  |  |
|  | Fine Crushing:   |                  |  |                                       |   |                                  |                                       |                        |             |           |          |                 |                          |                              |                            |            |           |        |   |                 |                 |  |  |  |
|  | Screens:   |                  |  |                                       |   |                                  |                                       |                        |             |           |          |                 |                          |                              |                            |            |           |        |   |                 |                 |  |  |  |
|  | Conveyors, transfer points:                            |                  |  |                                       |   |                                  |                                       |                        |             |           |          |                 |                          |                              |                            |            |           |        |   |                 |                 |  |  |  |
|  | Surge Pile or Bins:                                    |                  |  |                                       |   |                                  |                                       |                        |             |           |          |                 |                          |                              |                            |            |           |        |   |                 |                 |  |  |  |
| Other Agents   | Type of Agent (chemical or physical); Location; Source |                  |  |                                       |   |                                  | Other Agents Risk Level               |                        |             |           |          |                 |                          |                              |                            |            |           |        |   |                 |                 |  |  |  |
| Other Substances or Physical Agents (specify & rate risk level)                |  |                  |  |                                       |   |                                  |                                       |                        |             |           |          |                 |                          |                              |                            |            |           |        |   |                 |                 |  |  |  |
| Comments:  |  |                  |  |                                       |   |                                  |                                       |                        |             |           |          |                 |                          |                              |                            |            |           |        |   |                 |                 |  |  |  |

# Input Elements of the Tool

## Main Sections – Step 1

**Step 1: Testing History**

|                                   |  |
|-----------------------------------|--|
| Personal Air Testing Completed?   |  |
| Worker Dust Exposure Levels:      |  |
| Area Noise Mapping Completed?     |  |
| Personal Noise Testing Completed? |  |

**Step 1: Testing History**

|                                   |  |
|-----------------------------------|--|
| Personal Air Testing Completed?   |  |
| Worker Dust Exposure Levels:      |  |
| Area Noise Mapping Completed?     |  |
| Personal Noise Testing Completed? |  |

# Input Elements of the Tool

## Main Sections – Step 2

Site Occupational Hygiene Qualitative Assessment Form – Cement Plant

Ver. 1.0 / 23-Jun-2018  
Developed by: David G. Nilsson

See Menu Key on Sheet 2 for material and exposure criteria, as well as descriptions of worker groups and controls

### Step 2: Qualitative Assessment

Area: Quarry & Crushing Plant

| Process & Work Task Dust Emissions   | Sources/Locations                                      | Type of Material | Crystalline Silica Content of Material |
|--|--|------------------|--|
| Respirable Crystalline Silica & Respirable Dust -- process & work-task sources | Primary Crusher:                                       | Flow             |  |
|  | Silica Crusher:  | Flow             |  |
|  | Fine Crushing:   | Flow             |  |
|  | Screens:   | Flow             |  |
|  | Conveyors, transfer points:                            | Flow             |  |
|  | Surge Pile or Bins:                                    | Flow             |  |
|  | Roads & Yard:  | Flow             |  |
|  | Mobile Equipment:                                      | Flow             |  |
| Other:   | Flow   |                  |  |
| Other Dusts -- process or work-task sources                                    |  |                  |  |
| <b>Process &amp; Work Task Noise Emissions</b>                                 |  |                  |  |
| Noise -- process & work task sources   | Primary Crusher:                                       |                  |  |
|  | Silica Crusher:  |                  |  |
|  | Fine Crushing:   |                  |  |
|  | Screens:   |                  |  |
|  | Conveyors, transfer points:                            |                  |  |
|  | Surge Pile or Bins:                                    |                  |  |
|  | Roads & Yard:  |                  |  |
|  | Mobile Equipment:                                      |                  |  |
| Other:   |  |                  |  |
| <b>Other Agents</b>  | Type of Agent (chemical or physical); Location; Source |                  |  |
| Other Substances or Physical Agents (specify & rate risk level)                |  |                  |  |
| Comments:  |  |                  |  |

**Insight:** High silica materials may be present here from minor ingredients used to boost silica content in the Raw Mix.

Site Occupational Hygiene Qualitative Assessment Form – Cement Plant

Ver. 1.0 / 23-Jun-2018  
Developed by: David G. Nilsson

See Menu Key on Sheet 2 for material and exposure criteria, as well as descriptions of worker groups and controls

### Step 2: Qualitative Assessment

Area: Quarry & Crushing Plant

| Process & Work Task Dust Emissions   | Sources/Locations                                      | Type of Material | Crystalline Silica Content of Material |
|--|--|------------------|--|
| Respirable Crystalline Silica & Respirable Dust -- process & work-task sources | Primary Crusher:                                       | Flow             |  |
|  | Silica Crusher:  | Flow             |  |
|  | Fine Crushing:   | Flow             |  |
|  | Screens:   | Flow             |  |
|  | Conveyors, transfer points:                            | Flow             |  |
|  | Surge Pile or Bins:                                    | Flow             |  |
|  | Roads & Yard:  | Flow             |  |
|  | Mobile Equipment:                                      | Flow             |  |
| Other:   | Flow   |                  |  |
| Other Dusts -- process or work-task sources                                    |  |                  |  |
| <b>Process &amp; Work Task Noise Emissions</b>                                 |  |                  |  |
| Noise -- process & work task sources   | Primary Crusher:                                       |                  |  |
|  | Silica Crusher:  |                  |  |
|  | Fine Crushing:   |                  |  |
|  | Screens:   |                  |  |
|  | Conveyors, transfer points:                            |                  |  |
|  | Surge Pile or Bins:                                    |                  |  |
|  | Roads & Yard:  |                  |  |
|  | Mobile Equipment:                                      |                  |  |
| Other:   |  |                  |  |
| <b>Other Agents</b>  | Type of Agent (chemical or physical); Location; Source |                  |  |
| Other Substances or Physical Agents (specify & rate risk level)                |  |                  |  |
| Comments:  |  |                  |  |

**Insight:** High silica materials may be present here from minor ingredients used to boost silica content in the Raw Mix.









# Output Elements of the Tool

## Recommended Control Levels – Step 3

- + Provides banded levels of recommended controls based on measured and QA-assessed risk ratings
- + These are divided into two categories: fugitive dust, and spillage
- + For each location, the user is referred to the Control Options on a later sheet

No user input is needed for Step 3; the recommended levels are generated by the tool's programming, based on risk input

**Step 3: Recommended Control Levels, Silica & Respirable Dust**

*Refer to Control Options on Sheet 20 for suggested controls for fugitive dust and spillage reduction*

*Level 1 is the default minimum control level, even for areas not assessed and rated for exposure risk*

| Sources/Locations           | Overall Dust Exposure Risk Level | Recommended Control Levels  |                                  |
|-----------------------------|----------------------------------|-----------------------------|----------------------------------|
|                             |                                  | Fugitive Dust Control Level | Spillage Reduction Control Level |
| Primary Crusher:            |                                  | Level 1                     | Level 1                          |
| Silica Crusher:             |                                  | Level 1                     | Level 1                          |
| Fine Crushing:              |                                  | Level 1                     | Level 1                          |
| Screens:                    |                                  | Level 1                     | Level 1                          |
| Conveyors, transfer points: |                                  | Level 1                     | Level 1                          |
| Surge Pile or Bins:         |                                  | Level 1                     | Level 1                          |
| Roads & Yard:               |                                  | Level 1                     | Level 1                          |
| Mobile Equipment:           |                                  | Level 1                     | Level 1                          |
| Other:                      |                                  | Level 1                     | Level 1                          |

**Step 3: Recommended Control Levels, Silica & Respirable Dust**

*Refer to Control Options on Sheet 20 for suggested controls for fugitive dust and spillage reduction*

*Level 1 is the default minimum control level, even for areas not assessed and rated for exposure risk*

| Sources/Locations           | Overall Dust Exposure Risk Level | Recommended Control Levels  |                                  |
|-----------------------------|----------------------------------|-----------------------------|----------------------------------|
|                             |                                  | Fugitive Dust Control Level | Spillage Reduction Control Level |
| Primary Crusher:            |                                  | Level 1                     | Level 1                          |
| Silica Crusher:             |                                  | Level 1                     | Level 1                          |
| Fine Crushing:              |                                  | Level 1                     | Level 1                          |
| Screens:                    |                                  | Level 1                     | Level 1                          |
| Conveyors, transfer points: |                                  | Level 1                     | Level 1                          |
| Surge Pile or Bins:         |                                  | Level 1                     | Level 1                          |
| Roads & Yard:               |                                  | Level 1                     | Level 1                          |
| Mobile Equipment:           |                                  | Level 1                     | Level 1                          |
| Other:                      |                                  | Level 1                     | Level 1                          |

# Output Elements of the Tool

## Banded Control Options

### Control Options

+ Specific control options are presented to the user on this sheet, Levels 1 to 4

+ For silica and respirable dust, these are grouped into fugitive dust and spillage

+ For each location, the recommended control level is cross-referenced from Step 3 of the worksheets to the options here

+ The most appropriate controls are selected that will suit the site and the condition in question

+ For control levels 2 and higher, controls are also selected from all lower levels – e.g. if Level 3 is called for, controls in Levels 1 and 2 are also applied, as appropriate

The screenshot shows a spreadsheet with a red arrow pointing to the 'Control Options' tab. The spreadsheet is divided into two main sections: 'Spillage Control Options' and 'Fugitive Dust Control Options'. Each section is organized into four levels (Level 1 to Level 4) of control options. The 'Spillage Control Options' section includes categories like 'Containment - Granular', 'Containment - Powder', and 'Cleanup Method - All Materials, Moderate Amounts'. The 'Fugitive Dust Control Options' section includes categories like 'Containment - Granular', 'Containment - Powder', 'Worker Isolation', and 'General'. The spreadsheet also shows a navigation bar at the bottom with tabs for various locations and control options.

| Spillage Control Options   |  |   |   |
|--|--|---|---|
| Level 1  | Level 2  | Level 3   | Level 4   |
| <b>Containment - Granular</b><br>Belt tracking optimized<br>Belt drop heights minimized<br>Belt transfer targetting optimized<br>Belt tension optimized  | <b>Containment - Granular</b><br>Belt side skirting - side-contact type<br>Matt drop energy reduction (e.g. rock ladders/shelves)<br>Rock boxes at loading zones<br>Screen side skirting<br>Screen feed suppression - chutes, blankets<br>Belt scrapers/cleaners (with dribble chutes) | <b>Containment - Granular</b><br>Impact roller upgrade<br>Tail wing pulley vibration minimized<br>Double-layer side skirts<br>Double-layer tail skirts  | <b>Containment - Granular</b><br>Impact beds at belt loading zones<br>Troughing angle increase<br>Fully-enclosed transfer points and downstream belts<br>Belt cleaners - air knife type (only w. dust collector)<br>Return roller elimination (e.g. tension bar, belt flipping) |
| <b>Containment - Powder</b><br>Air slide seals intact<br>Blower lines, silos - seals intact<br>Blower lines, silos - pressure balanced<br>Non-pressurized conveyors - drop heights minimized<br>Drag conveyor hatches - seals intact<br>Bucket elevators - fully enclosed, seals intact<br>Silos - pressure relief vents<br>Silos - high level / high pressure sensors | <b>Containment - Powder</b><br>Non-pressurized conveyors - enclosure air volume optimize<br><b>Cleanup Method - All Materials, Small Amounts</b><br>Vacuum - portable HEPA<br>Vacuum - plumbed in line, truck or stationary system   | <b>Cleanup Method - All Materials, Moderate Amounts</b><br>Vacuum - plumbed in line, truck or stationary system<br>Skid steer - enclosed cab, positive pressure, filtered<br>Floor/road sweeper - enclosed cab, positive pressure, filtered | <b>Cleanup Method - All Materials, Large Amounts</b><br>Vacuum - plumbed in line, truck or stationary unit<br>Skid steer - enclosed cab, positive pressure, filtered<br>Wheel loader - enclosed cab, positive pressure, filtered  |
| <b>Cleanup Method - All Materials, Small Amounts</b><br>Floor sweeper - walk-behind<br>Shovel, broom - dust suppressant  |  |   |   |

| Fugitive Dust Control Options  |  |  |  |
|--|--|--|--|
| Level 1  | Level 2  | Level 3  | Level 4  |
| <b>Containment - Granular</b><br>Belt drop heights minimized<br>Belt transfer targetting optimized<br>Belt tension optimized<br>Roads, yard - water or chemical suppression  | <b>Containment - Granular</b><br>Belt side skirting - side-contact type<br>Matt drop energy reduction (e.g. rock ladders/shelves)<br>Screen feed suppression - chutes, blankets<br>Stockpiles, raw materials - pile watering<br>Roads and grounds - water truck or long-term suppressant | <b>Containment - Granular</b><br>Impact roller upgrade<br>Tail wing pulley vibration minimized<br>Double-layer side skirts<br>Double-layer tail skirts<br>Partially enclosed transfer points | <b>Containment - Granular</b><br>Dust collector system - fully sealed enclosures<br>Fully enclosed and sealed transfer points<br>Impact beds at belt loading zones<br>Troughing angle increase<br>Fully enclosed screen decks (e.g. rigid covers, sealed)<br>Fully covered belts |
| <b>Containment - Powder</b><br>Air slide seals intact<br>Blower lines, silos - seals intact<br>Blower lines, silos - pressure balanced<br>Drag conveyor hatches - seals intact<br>Bucket elevators - fully enclosed, seals intact<br>Silos - pressure relief vents<br>Silos - high level / high pressure sensors | <b>Containment - Powder</b><br>Non-pressurized conveyors - enclosure air volume optimize<br><b>Worker Isolation</b><br>Cab, booth - basic enclosure  | <b>Worker Isolation</b><br>Cab, booth - positive pressure, filtered supply   | <b>Worker Isolation</b><br>Cab, booth - positive pressure, HEPA filter   |
| <b>General</b><br>Eliminate compressed air dust cleanup<br>Eliminate clothing dust blow-off  | <b>General</b><br>Automate tasks - e.g. remote sensors, auto-lube units  |  |  |

# Output Elements of the Tool

## Results Page – Risk Summaries

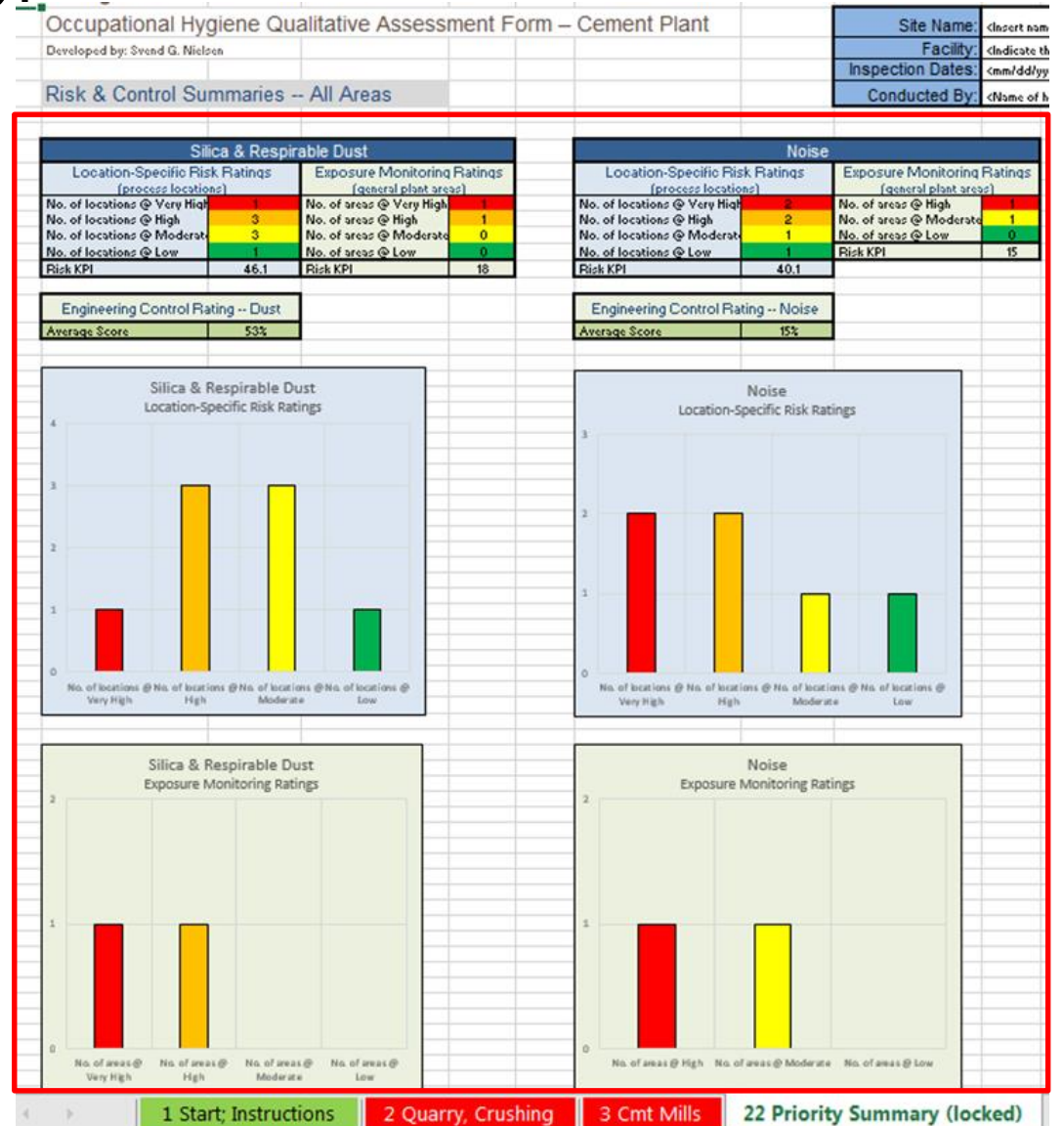
All of the results from the input sheets are summarized on the final page.

*Note:* this sheet is locked and no user input is permitted here.

### Risk Summaries

The summaries presented here are:

1. Number of locations at Low, Mod, High, or Very High risk for silica/resp. dust and noise (summary tables and graphs)
2. Exposure monitoring ratings for silica/resp. dust and noise (summary tables and graphs)
3. Engineering control ratings for silica/resp. dust and noise (tables)
4. Risk KPI's are calculated for QA-Assessed ratings and Exposure Monitoring ratings





# Work Through An Example For Cement Industry



# Discussion and Review of Your Industry

- Chemical
  - Pharmaceutical
  - Automotive
  - Healthcare
  - Oil and Gas
  - Mining
  - ...
- 1 - List your work areas
  - 2 - List the sources of a hazard for one work area
  - 3 - List the top factors for severity and likelihood
  - 4 - List the kinds of workers that are impacted in this work area
  - 5 - Take this information back to your company, add the other work areas and create your own tool

# Overview

## Design Considerations

- Relevance and value to multiple levels of health and operations management: site, regional, national and global
- Usability by non-IH professionals while still obtaining valid output
- User-friendly interface and expedient completion, including for users with basic computer skills
- Minimal input effort; high degree of auto-completion of fields, drop-down menus, etc.
- Understandable to users whose first language is not English

# Implementation

## Global Roll-Out

- Management Awareness and Endorsement
- Tool Technical Support
- Communication Plan
- Training
- Data Collection and KPI Interpretation
- Communication of KPI Value, Goals and Forward Planning

# Challenges

Medium & Long Term

- Controlled Evolution of the Tools
- Continued Upper Management Support
- Change Management Plan
- KPI Good News/ Bad News Delivery



Questions?

---

**Contact:**

---

**Nancy M. McClellan, M.P.H., CIH,  
CHMM**

---

**Occupational Health  
Management, PLLC**

---

**(+1-224-517-2990)**