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# Title Project : Industrial relocation

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Type : Prevention

Departement : Industrial

## Undesirable Events

| Code | Description |
|---|---|
| E1 | Work-related illness |
| E2 | Drop in productivity |
| E3 | Drop in quality |
| E4 | Inadequate design |
| E6 | Explosion and fire |
| E5 | Pollution |
| E7 | ..... |

## Factors

| Code | Description |
|---|---|
| F1 | Mechanical |
| F2 | Electrical |
| F3 | Human |
| F4 | Physical |

## sources of dangers

## F1

| Code | Description |
|---|---|
| F11 | Moving elements : Chucks, tools, robots, turntables, grinders, conveyer belts |
| F12 | Handling : Bridge crane, forklit, stacker, motorized trailer |
| F13 | Physical explosions : Dust, gas, vapor, tank depressurizing, liquid on very hot surfaces |
| F14 | Heights : Ladders, staircases, catwalks |
| F15 | Movement : Obstacles on the ground, slopes, openings in the ground |
| F16 | Devices and elements under pressure : Compressors, gas cylinders, hydraulic or pneumatic lines |

| | |
|---|---|
| F17 | Elements under strain |
| F18 | staircases |
| F19 | catwalks... |

## F2

| Code | Description |
|---|---|
| F21 | DC or AC electrical current |
| F22 | Static electricity |

## F3

| Code | Description |
|---|---|
| F31 | Hight-risk behavior |
| F32 | Stress |
| F33 | Static electricity |

## F4

| Code | Description |
|---|---|
| F41 | Ambient lighting |
| F42 | Video screens |
| F43 | Ambient noise |
| F44 | Vibrations |
| F45 | Contact temperature |
| F46 | Work station design |
| F47 | Hostile environments |
| F48 | ..... |

# Impacts

| Code | Description |
|---|---|
| IP | On performance |
| IC | On cost |
| ID | On delays |
| IE | on the environment |

# Probability Scale

| Relative concentration of risk | | Probability of occurrence |
|---|---|---|
| 0.0 | 0.15 | 0.1 |
| 0.15 | 0.25 | 0.3 |

| | | |
|---|---|---|
| 0.25 | 0.5 | 0.5 |
| 0.5 | 0.75 | 0.7 |
| 0.75 | 0.9 | 0.9 |

## Estimation of Impact

| | Impact : IP | Impact : IC | Impact : ID | Impact : IE |
|---|---|---|---|---|
| E1 | 7 | 7 | 3 | 1 |
| E2 | 9 | 7 | 6 | 1 |
| E3 | 7 | 6 | 6 | 1 |
| E4 | 6 | 6 | 4 | 5 |
| E5 | 7 | 5 | 2 | 9 |
| E6 | 7 | 7 | 7 | 8 |

## Les Matrices AHP

### E1

| | F1 | F2 | F3 | F4 | Weight |
|---|---|---|---|---|---|
| F1 | 1.0 | 5.0 | 3.0 | 0.5 | 0.28 |
| F2 | 0.2 | 1.0 | 0.5 | 0.13 | 0.06 |
| F3 | 0.33 | 2.0 | 1.0 | 0.14 | 0.1 |
| F4 | 2.0 | 7.69 | 7.14 | 1.0 | 0.56 |

### E2

| | F1 | F2 | F3 | F4 | Weight |
|---|---|---|---|---|---|
| F1 | 1.0 | 3.0 | 0.25 | 0.5 | 0.14 |
| F2 | 0.33 | 1.0 | 0.11 | 0.14 | 0.05 |
| F3 | 4.0 | 9.09 | 1.0 | 2.0 | 0.52 |
| F4 | 2.0 | 7.14 | 0.5 | 1.0 | 0.29 |

### E3

| | F1 | F2 | F3 | F4 | Weight |
|---|---|---|---|---|---|
| F1 | 1.0 | 4.0 | 0.33 | 2.0 | 0.22 |
| F2 | 0.25 | 1.0 | 0.13 | 0.5 | 0.06 |
| F3 | 3.03 | 7.69 | 1.0 | 7.0 | 0.62 |
| F4 | 0.5 | 2.0 | 0.14 | 1.0 | 0.11 |

### E4

| | F1 | F2 | F3 | F4 | Weight |
|---|---|---|---|---|---|
| F1 | 1.0 | 2.0 | 4.0 | 7.0 | 0.51 |
| F2 | 0.5 | 1.0 | 3.0 | 5.0 | 0.31 |
| F3 | 0.25 | 0.33 | 1.0 | 2.0 | 0.12 |
| F4 | 0.14 | 0.2 | 0.5 | 1.0 | 0.06 |

## E5

| | F1 | F2 | F3 | F4 | Weight |
|---|---|---|---|---|---|
| F1 | 1.0 | 6.0 | 8.0 | 2.0 | 0.54 |
| F2 | 0.17 | 1.0 | 3.0 | 0.33 | 0.11 |
| F3 | 0.13 | 0.33 | 1.0 | 0.17 | 0.05 |
| F4 | 0.5 | 3.03 | 5.88 | 1.0 | 0.3 |

## E6

| | F1 | F2 | F3 | F4 | Weight |
|---|---|---|---|---|---|
| F1 | 1.0 | 0.33 | 3.0 | 4.0 | 0.25 |
| F2 | 3.03 | 1.0 | 5.0 | 7.0 | 0.57 |
| F3 | 0.33 | 0.2 | 1.0 | 2.0 | 0.11 |
| F4 | 0.25 | 0.14 | 0.5 | 1.0 | 0.07 |

## Calculation of the risk factor concentration for each undesirable event

| Undesirable event | Linked risk factor category | Factors of category Xi | Weighting:Yi | Xi*Yi | Fraction of total Eq | Probability of Occurence | Max Impact | Level of Risk |
|---|---|---|---|---|---|---|---|---|
| E1 | F1 | 7 | 4.0 | 28.0 | -- | -- | -- | -- |
| | F4 | 7 | 3.0 | 21.0 | -- | -- | -- | -- |
| | | | Sub-Total E1 | 49.0 | 0.23 | 0.3 | 7.0 | 2.1 |
| E2 | F1 | 7 | 4.0 | 28.0 | -- | -- | -- | -- |
| | F3 | 3 | 2.0 | 6.0 | -- | -- | -- | -- |
| | F4 | 7 | 3.0 | 21.0 | -- | -- | -- | -- |
| | | | Sub-Total E2 | 55.0 | 0.26 | 0.5 | 9.0 | 4.5 |
| E3 | F3 | 3 | 2.0 | 6.0 | -- | -- | -- | -- |
| | | | Sub-Total E3 | 6.0 | 0.03 | 0.1 | 7.0 | 0.7 |
| E4 | F4 | 7 | 3.0 | 21.0 | -- | -- | -- | -- |
| | | | Sub-Total E4 | 21.0 | 0.1 | 0.1 | 6.0 | 0.6 |

| Undesirable event | Linked risk factor category | Factors of category Xi | Weighting:Yi | Xi*Yi | Fraction of total Eq | Probability of Occurence | Max Impact | Level of Risk |
|---|---|---|---|---|---|---|---|---|
| E5 | F4 | 7 | 3.0 | 21.0 | -- | -- | -- | -- |
| | F1 | 7 | 4.0 | 28.0 | -- | -- | -- | -- |
| | | | Sub-Total E5 | 49.0 | 0.23 | 0.3 | 9.0 | 2.7 |
| E6 | F1 | 7 | 4.0 | 28.0 | -- | -- | -- | -- |
| | F2 | 2 | 1.0 | 2.0 | -- | -- | -- | -- |
| | | | Sub-Total E6 | 30.0 | 0.14 | 0.1 | 8.0 | 0.8 |
| | | | Total | 210.0 | 100 % | | | |

**Result :** Limit ACCEPT = 2.5

| Accepted Risks | |
|---|---|
| Code | Description |
| E1 | Work-related illness |
| E3 | Drop in quality |
| E4 | Inadequate design |
| E6 | Explosion and fire |

| Risks to be reduced | |
|---|---|
| Code | Description |
| E2 | Drop in productivity |
| E5 | Pollution |