

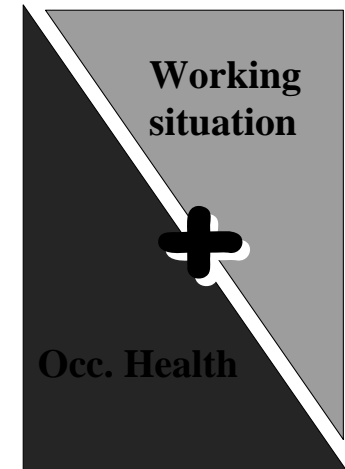
# Strategy of prevention of the risks due the noise

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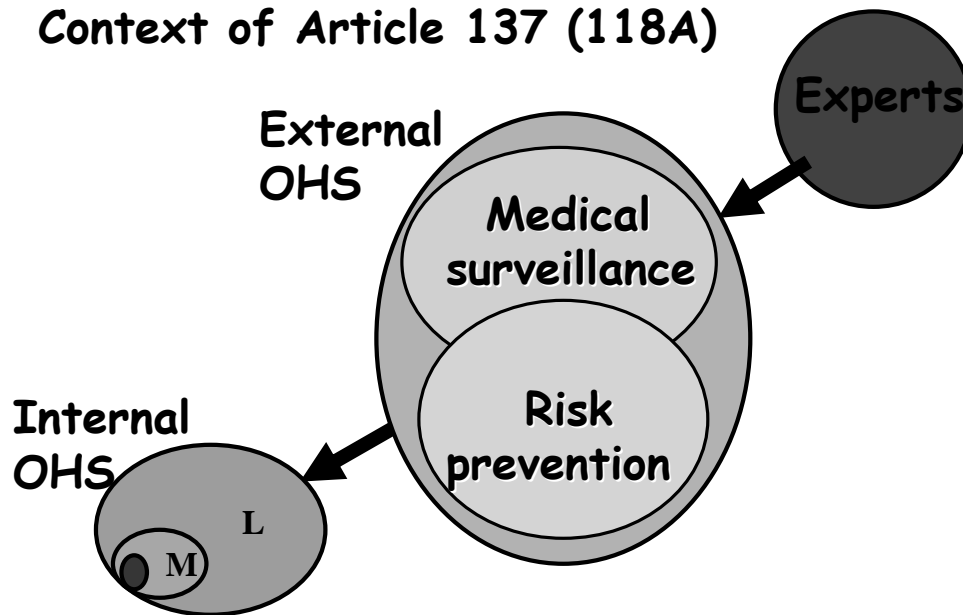
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## OH partners

- Employees
- Management
- Safety officers
- Occ. physicians
- Occ. hygienists
- Ergonomists
- Experts



## Context of Article 137 (118A)



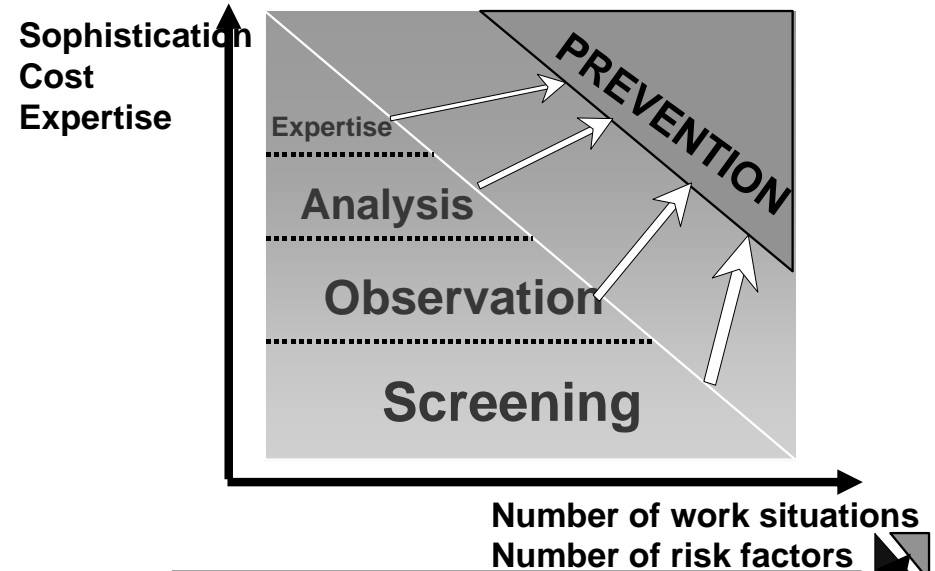
Occupational Health Services structure

## Objectives

- Coordination of all actors
- Valid and useable standards with sufficient scope for practical application
- Prevention vs assessment
- Qualitative vs quantitative
- « Evaluation » vs « Measurements »
- Cost-effectiveness
- Methods applicable in and by SMEs

	Stage 1 "Screening"	Stage 2 "Observation"	Stage 3 "Analysis"	Stage 4 "Expertise"
• When?	Systematically	When a "problem" is detected	More complicated Cases	Very complex cases
• How?	Opinions	Qualitative observations	Ordinary measurements	Specialised measurements
• Cost?	Very low	Low	Average	High
• Duration (order of magnitude)	10 min	2 hours	1 day	A few days
• By whom?	Workers + company management	Workers + company management	Same + specialists	Same + specialists + experts
• Knowledge - working conditions - ergonomics	Very high Low	High Average	Average High	Low Specialised

## Prevention Strategy




## Characteristics

- **Participative**
  - Workers play the essential role in the dynamics of improvement
  - Occupational health specialists and experts are helping
- **Structured in 4 complementary levels**
  - Requiring complementary knowledge and competencies

## Level 1, Screening

*inside Déparis*

NOISE	NOTES
<p><b>Desired situation:</b></p> <ul style="list-style-type: none"> <li>▪ If in a workshop: it is possible to speak normally at a distance of about 1 meter</li> <li>▪ If in an office, there is no noise which can cause discomfort or distraction</li> </ul> <p><b>Aspects to consider:</b></p> <ul style="list-style-type: none"> <li>▪ the origin of the noise and the state of the machines or installations (air conditioning...) from which this noise is emitted</li> <li>▪ the localization of these sources of noise with respect to the employees</li> <li>▪ the materials (porous?) which cover the walls to absorb the noise</li> <li>▪ the materials (heavy?) used for the walls separating the rooms or spaces</li> <li>▪ the leaks in the walls separating the spaces</li> </ul>	<p>What to do in <u>practical terms</u> to improve the situation?</p>
<p>Aspects studied more in details:</p>	

## Level 2: *Observation*

## Objectives

- **Collect general information on the noise sources:**
  - In the field
  - By - With the workers and the managerial staff
- **Determine immediate technical measures to eliminate or reduce the noise levels**
- **Determine whether an *Analysis* (level 3)**
  - Is necessary
  - With what priority
  - With what objectives?

## Who?

- **People in the company**
  - workers
  - managerial staff
  - engineering and design department
  - internal OH staff
- **Knowing the work situation perfectly**

## How? (1)

- **Brief description of the work situation:**
  - Sketch
  - Localisation of the noise sources
  - Localisation of the working stations
  - Workers concerned



## How? (2)

- **Information separately for each source:**
  - Description
  - Voice level to be heard at 1 m of distance
  - Estimation of the noise level

Voice	Normal	Raised	Very strong	Shouted	Extreme
Level (dB(A))	50	70	85	90	100



## How? (3)

- **Possibilities for reduction at the source**
  - Vibration of parts, panels, ground
  - Impacts due to falls of parts on a hard surface
  - Mechanical noise
  - Exhaust of air and air jets
  - Pure tone noise (noise of a particular tonality)



## How? (4)

- **Possibilities for reduction around the source**
  - Worker away from the source
  - Screen between the sources and the workers



## How? (5)

- **Possibilities for treatment of the room**
  - requires an OH staff at the level 3, *Analysis*
- **Qualify the situation in:**
  - Testing the reverberation
  - Characterizing the materials on the ceilings, walls...
  - Checking the bypass from one room to another or from outside



## Synthesis (1)

- **Evaluation of the current risk on basis of**
  - The observations carried out above
  - The opinions of the workers (difficulties of hearing)



## Synthesis (2)

- **Criteria**
  - **Light discomfort:** voice higher than normal
    - offices with 50 dB(A)
  - **High discomfort:** high voice
    - workshops with about 70 dB(A)
  - **Low risk of impairment:** very strong voice
    - level close to 85 dB(A)
  - **Average risk of impairment:** shouted voice
    - level close to 90 dB(A)
  - **High risk of impairment:** extreme voice
    - level close to 100 dB(A)



## Synthesis (3)

- **Residual risk after prevention**
  - Evaluate the probable future state if prevention measures considered above are taken
- **List of actions**
  - Who does what and when by priorities
- **Requirement for an *Analysis* (level 3)**
  - On the basis of evaluated residual risk
    - What priority
    - Objectives
    - What sources and to reach what level of risk?



## Synthesis (4)

- Individual protection
  - What protection?
  - Carried by whom?
  - At what times and for how long?



## Level 3, *Analysis*



## Objectives

- Evaluate the real exposure of the workers by measurements
- Look further for prevention measures
  - Through particular measurements
  - Using more specialized techniques
- Determine whether an *Expertise* (level 4) is needed



## Who?

- People of the company with the assistance of OH staff having:
  - Methodological competences
  - Measuring instruments



## Exposure of the workers

1. **Grouping of the workers having the same exposure**
  - All welders; all grinders; employees in the same workshop or office
2. **Representative period (in hours, days, weeks)**
  - To cover all the circumstances of noise exposure (several operating cycles, if they exist)
    - Example: automobile assembly: 2 to 4 h; blast furnace workers: 15 days

## Exposure of the workers

3. **Moments of measuring**
  - During various phases of work
  - Dates, hours
  - Prove their representativeness compared to the period above

## Exposure of the workers

4. **Measuring techniques**
  - Apparatus, localization of measurements
5. **Measurements of the  $N_{A,eq}$  at each station**
  - duration of exposure per day to the measured conditions
  - partial personal exposure level  $N_{EP,i} = N_{aeq} - K$

Duration	1'	5'	10'	20'	30'	45'	1h	1.5h	2h	3h	4h	5h	6h	8h
K	27	20	17	14	12	10	9	7	6	4	3	2	1	0

## Example: group workers

Phase of work	Exposure time Per day	$N_{aeq}$	Impact > 140 db	$N_{ep,i}$ d B(A)	Comments
Grinding	2 h	98	Not	92	
Another work	4 h	86	Not	83	
Drilling	1 h	90	Not	81	
Others	1 h	70	Not	61	

## Personal exposure level $N_{EP}$

6. Calculate  $N_{EP}$  combining the  $N_{EP,i}$  according to their difference

Difference dB(A)	0	1	2	3	4	5	6	7	8	9	10	12
Addition dB(A)	3	2,5	2,1	1,8	1,4	1,2	1,0	0,8	0,6	0,5	0,4	0,2

## 7. Current risk

- Discomfort: if  $> 50-60$  dB(A)
- Impairment: if  $> 85$  dB(A)
- Percentage of subjects likely to become impaired at age 60, after 40 years of exposure under the same noise conditions
  - Handicap (average loss  $> 35$  db)
  - Disability (average loss  $> 50$  db)

$N_{ep}$ dB(A)	85	90	92	94	97	98	99	100
Risk disability %	6	9	12	15	20	23	26	30
Risk handicap %	21	26	29	34	43	47	51	56

## 8. Conclusions

- Work phases to investigate in priority
  - Work phases with  $N_{EP,i}$  higher than the desired noise level
- Main noise sources responsible for these  $N_{EP,i}$

## 1. Thorough study of the noise sources

1. Modifications of the work techniques
2. Characteristics of the noise sources
  - Identification of
    - the causes (vibration, impact...)
    - the sources (panels and parts...)
  - Measurements at the level of the sources
    - taking the directivity into account
3. Reduction of the noise at the source
  - Special attention to the transmission of vibration



## 2. Thorough study of the noise propagation

- Detailed attention to
  - The distance source-workers
  - The directivity of the sources
  - Screens between sources and workers



## 3. Thorough study of the room

### 1. Acoustical treatment of the room

- Detailed attention to:
  - Echoes
  - The reverberation
  - Materials on the walls, ceiling, ground

### 2. Insulation

- between adjacent rooms
- with outside
- Seals, cracks, openings, gaskets
- Increase the weight of the walls



## 4. Work reorganisation

- Reorganization of
  - The work spaces
  - The work sequence
  - The working hours
- To reduce the exposure durations to the highest noises



## 5. Anticipated future state

### 1. Exposure of the workers: anticipated state

- Estimate of the anticipated exposure durations
- Estimate the anticipated partial  $N_{EP, i}$
- Compute the anticipated  $N_{EP}$  as before

### 2. Residual risk

- Residual damage, discomfort or impairment
  - Prediction of the risk of impairment



## 6. Anticipated future state

1. Is a level 4, *Expertise* needed?
  - What priority?
  - For what sources or work phases?
2. List of the prevention measures considered
  - Who does what and when in priority?

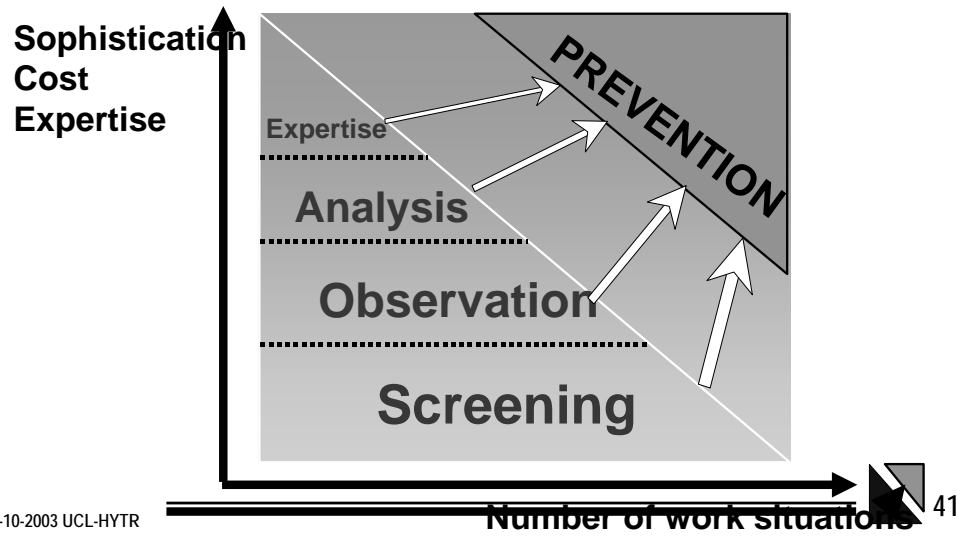
## Anticipated future state

3. Short-term protection measures: individual protection
  - What protection?
  - For whom?
  - When and for how long?
4. Medical supervision
  - Legal audiometric examinations
  - Audiometric examinations within the framework of a hearing conservation programme

## Level 4: *Expertise*

- Objectives
  - Better characterize certain noise sources or acoustical phenomena
- Who?
  - People of the company with the additional assistance of an expert
- How?
  - According to the case:
    - Octave band or third octave band analysis
    - Measurement of the reverberation time
    - Measurement of the resonance of machines
    - Measurement of the insulation between rooms

# Prevention Strategy



*Thanks for your attention*