ORDRE DES INGÉNIEURS DU QUÉBEC

NOVEMBRE 2017 SESSION

Open-book examination
Calculators : only authorized models
Duration : 3 hours

14-IN-B4 INDUSTRIAL SAFETY AND HEALTH

Question 1 (20 marks)

A **hydraulic press brake** (Figure 1) is used for bending metal sheets. The operator must manually insert the sheet and hold it during folding (Figure 2). The bending tools consist of a die (lower tool) and a punch (upper tool). The operator inserts the metal sheet between the tools, pushes it against a rear stop and holds it in place. He activates a pedal and the punch comes down and folds the piece. The latter takes the shape of the tools and folds (bending movement) towards the punch. Then, the punch rises and the operator removes the folded part, inspects it by manipulating it and places it in a box located at ground level. He turns around to pick up another metal sheet which is placed on a table of height approximately up to his elbow and inserts it between the tools. The folding cycle repeats itself. In addition, the operator must also change the folding tools which are heavy regularly for producing parts of different shapes.

Figure 1

Figure 2

What are the risks for the operator of the press? (10 marks)

What are the risk reduction measures that can be used? (10 marks)

Risks for the operator of the press	Risk reduction measures

Question 2 Answer using True or False (20 marks)

(i) The main objective of the Occupational Health and Safety Act (LSST) is to reduce the costs of accidents and occupational diseases in Quebec, thereby making Quebec companies more competitive. (5 marks)

(ii) Personal protection is more effective and useful than collective protection because it aims to protect people directly. (5 marks)

(iii) The temporary assignment mechanism reduces the number of days lost and reported to the CNESST as a result of accidents in the workplace. (5 marks)

(iv) In order to be effective and proactive in prevention, attention must be paid to events that cause property damage and to events that have caused nothing but could have serious consequences. (5 marks)

Question 3 (20 marks)

You are a manager and an engineer in a large food processing company in Quebec. The company employs hundreds of workers. The processing plant has several hazardous machines. In order to comply with food hygiene standards and quality standards (certification), machines must be cleaned daily and rigorously. This cleaning activity requires workers to partially dismantle equipment and to expose themselves to several types of risk (eg crushing by moving parts). When cleaning, workers remove guards and safety devices. Equipment must be running to facilitate cleaning.

(i) As a manager and engineer how do you react to this situation? Why? (10 marks)

(ii) What risk reduction measures can you use to improve risk management associated with machine **cleaning** in the company? (5 marks)

(iii) What risk reduction measures can you use to improve risk management associated with machine **repairs** in the company? (5 marks)

Question 4 (20 marks)

200 000 hours are equivalent to the annual work of 100 workers, 40 hours per week and 50 weeks. Accident statistics compiled in two factories are:

<u>Factory A</u>

Number of workers: **120**

Number of accidents: **12**

Number of days lost: **80**

Number of hours worked: **301 972**

<u>Factory B</u>

Number of workers: **50**

Number of accidents: **8**

Number of days lost: **30**

Number of hours worked: **50 284**

Calculate for the two factories (A and B):

(i) the incident rate (per 100 workers) (5 marks)

(ii) the severity index (5 marks)

(iii) the severity rate (per 200,000 hours) (5 marks)

(iv) the frequency rate (per 200,000 hours) (5 marks)