ORDRE DES INGÉNIEURS DU QUÉBEC

MAY 2020 SESSION

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

14-EC-2 ENGINEERING IN SOCIETY-HEALTH AND SAFETY

Question 1. (20 marks)

In Quebec, the occupational health and safety law (LSST) and the occupational health and safety regulation (ROHS) provide the framework for occupational health and safety (OHS). You hold the position of engineer and manager in the production unit in a manufacturing plant that manufactures metallic parts. Several equipment are used and some machines are to be replaced because they are very old. As a manager and supervisor in this company in Quebec, you must ensure occupational health and safety in the company for several reasons.

a. List these reasons (4 marks).

b. Explain how you will manage the health and safety of the fifty machine operators and two mechanics working in the production unit by referring to the LSST and ROHS. (16 marks)

Question 2. (20 marks)

Indicate whether the following statements are TRUE or FALSE by explaining your answer by referring to the appropriate documents.

(i) Before accepting a mandate, the engineer must take into account the limits of his knowledge and skills as well as the means available to him to execute it. (5 marks)
(ii) An engineer must have a thorough knowledge of the work before approving the diagrams drawn up by a junior engineer. (5 marks)
(iii) The engineer must respond as soon as possible to all correspondence from the syndic of the Order, the assistant syndic or a corresponding syndic, investigators, members of the professional inspection committee or the secretary of that committee. (5 marks)
(iv) An engineer working on a particular project, who realizes that public safety is at stake is required to inform his client. (5 marks)

Question 3 (20 marks)

Plastic injection presses are used for manufacturing plastic products. The commission des normes, de l'équité, de la santé et la sécurité du travail (CNESST) described in a guide how to analyze risk using four factors namely: (i) hazards, (ii) hazardous situations, (iii) dangerous

events and (iv) possible harm. An example of electrical hazard in the injection molding machine is described in Table 1.

Table 1: Electrical risk for the injection molding machine

Tasks	**Hazard**	**Hazardous situation**	**Hazardous event**	**Possible harm**
Operation	Electric – electrical panel of machine	Worker in proximity of live electrical parts during operation	Worker unintentionally in contact with live electrical parts	Electrocution, electric shock
Maintenance	Electric – electrical panel of machine	Worker in proximity of live electrical parts during maintenance	Worker unintentionally in contact with live electrical parts	Electrocution, electric shock

A horizontal **plastic injection molding machine** is used for molding plastic parts. The machine is used in **automatic mode**. A robot will pick up the molded part after each cycle through the top of the mold area. The robot places the molded part on nearby conveyor to move the molded parts.

Maintenance tasks are performed by mechanics and electricians on the hydraulic system, the heating system and the electrical system of the press to ensure good molding quality. The molds, which are heavy, are also changed on the machine by workers to produce different plastic parts. A crane is used to transport the molds. Maintenance tasks on the robot and conveyor are also performed. Workers (set-up and mold changing personnel) can intervene in the mold area in case of a problem (ex. unjamming).

Identify the **tasks, hazards, hazardous situations, hazardous events and harm** associated with these hazards for the various tasks which are described. **It is important to identify the most relevant ones.** (10 marks)

Tasks	**Hazards**	**Hazardous situations**	**Hazardous events**	**Possible harm**

Complete the table by explaining for each task how the risks are reduced based on the hierarchy of risk reduction methods. (10 marks)

Question 4 (20 marks)

i. Give three examples of confined spaces. (3 marks)

ii. What are the main risks associated with interventions into these three confined spaces? Describe the interventions and the risks (8 marks)

iii. How can the risks associated with the three confined spaces be reduced? Describe for the interventions and risks identified in part (ii) how the risks are reduced. (9 marks)