Problem Statement: The Central City Fire Department wants to create a database that keeps track of hazardous materials used by companies in the city. They currently use a manual system but find that it is hard to keep current. In addition, they would like to have the database loaded on small laptop computers that can be carried into the firm when the fire department does its inspections. The laptops can also be carried by each fire engine so that a quick scan of the database can be performed as the engine is responding to a fire.

Information about a hazardous product includes a unique material identifier and the material name. For each uniquely identified product, information about its suppliers, including a unique supplier number, a name, and a phone number is needed. Several suppliers may supply a specific hazardous material as identified by its identifier. The final information kept about a hazardous product is its unit of measure. This includes a unique code and a description.

The fire department inspects all firms in the city on an annual basis. During this inspection, all hazardous material on the firm's premises is inventoried. The fire department identifies each firm (end-user) using a unique identification number. It also stores the firm's name, address, the date the inventory was made, and the number of units of the product stored by the firm. This inventory count is actual number of units found on the day of the inventory. The fire department is not interested in storing a historical record of hazardous products used.

A portion of a sample report generated from the current manual system is shown on page 2. This report shows information for some of the hazardous products known to the fire department. You should study this report carefully since it demonstrates several relationships not explicitly described above.

Required: Given the information above, you are to produce the following:

a. **An Entity-Relationship Diagram**. Clearly show all the entities and the relationships between these entities. Be sure that the cardinality is shown on the entity-relationship diagram. Also, if there are any associative objects, be sure that they are shown.

b. **A Record Structure Diagram**. Using the entity-relationship diagram derived from part (a) above, create a RSD. Be sure that all the fields described above are shown somewhere in the diagram. If there does not appear to be a logical place to store a field, then the entity-relationship diagram is probably incorrect. Analyze your RSD for potential problems (see the summary on page 28 of the Guide to Data Modeling) and remove any problems that you find.

c. Using the tables defined in the RSD definition in part b, fill in the tables with the data values shown in the sample report (see page 2). The purpose for doing this is to show how the data would be stored in an actual database. Show all the data that is in the sample report.

If you make any assumptions other than those described above, note them in writing. Be sure that these assumptions make sense. Also make sure that the assumptions do not contradict any facts (implicit and explicit) given in the description and/or the sample report.

Your diagrams can be drawn by hand but please make them neat and legible. Points will be lost for sloppy and/or hard to read work.

The following is a sample report generated from the current manual system.

Central City Fire Department
Hazardous Material Report

Material Id 12D3
Material Name Sulfuric Acid

Unit of Measure
Unit Code G
Unit Desc Gallon

Supplier Information

Number	Name	Phone
123	ABC Chem	233-4433
545	Acme Chem	532-9999

End-User Inventory Information

Id Number	Name	Addr	Inventory Date	Quantity
3223	Boeing	100 1st West	2/5/94	200
7560	Pacific Fish	123 Main	6/6/94	150

Material Id 16X3
Material Name Hydrogen Peroxide

Unit of Measure
Unit Code G
Unit Desc Gallon

Supplier Information

Number	Name	Phone
123	ABC Chem	233-4433
690	Smith Supply	860-8211
800	KHX	545-9800

End-User Inventory Information

Id Number	Name	Addr	Inventory Date	Quantity
3223	Boeing	100 1st West	3/10/94	2,450
8559	Clark Metals	673 SW 8th	1/2/94	1,500
2312	Black Manuf	512 15th NW	11/2/93	1,300

Material Id 54F3
Material Name Sodium Hydroxide

Unit of Measure
Unit Code P
Unit Desc Pound

Supplier Information

Number	Name	Phone
422	Jorgen Corp	911-8877

End-User Inventory Information

Id Number	Name	Addr	Inventory Date	Quantity
3223	Boeing	100 1st West	8/8/94	120
8559	Clark Metals	673 SW 8th	2/10/94	190
7663	Sally's Soap	201 Lynn Ave	8/13/94	950
2312	Black Manuf	512 15th NW	4/15/94	200