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CSC 340

Waste Collection Company Database Design Document

Jim’s Waste Management Company is a national company that deals with collecting and disposing garbage and waste at various regions around the country. Because of the national scope of our company, we have a bunch of company sites in various regions. Some regions will have multiple sites. Each company site can be identified by its unique site number. It also has its address and which region it is located. Since the address will be detailed enough, with it, we could also find its region.

Each company site has multiple departments, and the department is not unique to the site, meaning there exists the same department in multiple companies. There are two main categories of departments that we would like to keep track of: the office department and the collection department. The offices deal with mainly the office stuff; they do all the management, marketing, and lobbying. The collection department handles the actual collection of waste. We are able to make pickups only at the regions our collection departments are located in. It is possible that a company site has both an office building and a waste collection building.

The staff that works for us will not ever deal with both the actual field work of waste collecting and working in our offices; our staff can only work in one department. We would want to keep track of all our staff’s name, ssn, and the department they work at. We also want their home address and contact info(email, phone number). Also, if a staff works for our collection department, we would like to know if they have a license to drive a garbage truck. We give each of our employees their own unique identification number when they begin working for us.

We use garbage trucks to manage the collection of waste. They are all supplied by suppliers of specialized garbage trucks. We keep in contact with a multiple of these suppliers, and they all have different company names. The supplier’s name, contact number, truck type, and truck price will have to be recorded. We would like to be able to identify each garbage truck by its unique number. We would also like to know at which company site the truck is stationed in because it can only be stationed in one collection site.

Obviously, the trucks are driven by our field staff when a pickup is being made. The trucks can be driven by any of our drivers who work in the same company site our trucks are stationed in.

We want to keep track of our customer’s name, address, and any contact information(email and telephone number). Also, we must be able to uniquely identify each customer. The customer must be within one of our working regions in order for us to make the pickup. To make a collection, our customers have to make order forms with unique form id# and identify how often they want their waste picked up, generally what kind of waste they have, and when they want the pickup made. When the order is made, a driver will fulfill the order and dump the waste at the closest dumpsite. Because of our ultra-advanced technology of our garbage disposing vehicles, only one staff member and one vehicle is required to complete an order. Each of our working regions will have at least one dumpsite, and each dumpsite has its own unique identification number.

Finally, after each pickup is completed, we would like to keep track of all of the pickups that we have completed, including our staff who completed the pickup and which garbage truck was used.

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First Draft Relational Schema

Company\_Site(siteID#, company\_address, region\_name)

Office\_Site (siteID#)

Collection\_Site(siteID#)

Departments(department\_name, siteID#)

Region (region\_name)

Dumpsite (dumpsite#, region\_name)

Customers (customerID, cust\_firstname, cust\_lastname, cust\_address, cust\_tel\_no, cust\_email, cust\_region\_name)

Garbage\_vehicle (vehicle#, vehicleType, siteID#, supplier\_name)

Pickup\_fulfilled (emp#, vehicle#, order#)

Pickup\_order (order#, start\_date, garbage\_type, recurring, customerID, dumpsite#)

Completed\_Pickups(completed\_date, order#)

Office\_staff (SS#, emp#, firstname, lastname, email, emp\_address, emp\_tel\_no, department, siteID#)

Field\_staff (SS#, emp#, firstname, lastname, email, emp\_address, emp\_tel\_no, license#, siteID#)

Suppliers (supplier\_name, supplier\_telNo, type\_offered, vehicle\_price)

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Relevant Functional Dependencies

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| Functional Dependency | Justification |
| siteID# → address, region\_name, office\_department | “Each company site can be identified by its unique site number” |
| dumpsite# → region\_name | “Each of our working regions will have at least one dumpsite, and each dumpsite has its own unique identification number.” |
| vehicle# → vehicleType, siteID#, supplier\_name | “We would like to be able to identify each garbage truck by its unique number.”  “We would also like to know at which company site the truck is stationed in because it can only be stationed in one collection site.” |
| order# → start\_date, garbage\_type, recurring, customerID | “To make a collection, our customers have to make order forms with unique form id# to identify how often they want their waste picked up, generally what kind of waste they have, and when they want the pickup made.” |
| customerID → cust\_firstname, cust\_lastname, cust\_address, cust\_tel\_no, cust\_email, cust\_region\_name | “Also, we must be able to uniquely identify each customer.” |
| supplier\_name → supplier\_telNo, type\_offered, vehicle\_price | “We keep in contact with a multiple of these suppliers, and they all have different company names.” |
| emp# → firstname, lastname, emp\_email, emp\_address, emp\_tel\_no, license#, department, SS#, siteID# | “We give each of our employees their own unique identification number when they begin working for us.” |
| SS# → firstname, lastname, emp\_email, emp\_address, emp\_tel\_no, license#, department, emp# | “We would want to keep track of all our staff’s name, ssn, sex, and the department they work at.” |
| vehicle# → region\_name | “We would also like to know at which company site the truck is stationed in because it can only be stationed in one collection site.” |
| order# → region\_name | “To make a collection, our customers have to make order forms with unique form id# to identify how often they want their waste picked up, generally what kind of waste they have, and when they want the pickup made.”  order# → customerID |
| order#, completed\_date → vehicle#, emp#, site#, dumpsite# | “Finally, after each pickup is completed, we would like to keep track of all of the pickups that we have completed, including our staff who completed the pickup and which garbage truck was used. “ |
| address → region\_name | “Since the address will be detailed enough, with it, we could also find its region.” |

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Finalizing the Relations to 3NF

First get FC:

1. Company\_Site(siteID#, company\_address)  
   Address(address, region\_name)  
   Decomposed Company\_Site from initial relational schema to 2NF. region\_name could be found from just company\_address
2. Office\_Site(siteID#)
3. Collection\_Site(siteID#)
4. Departments(department\_name, siteID#)
5. Region(region\_name)
6. Dumpsite(dumpsite#, region\_name)
7. Customers(customerID, cust\_firstname, cust\_lastname, cust\_address, cust\_tel\_no, cust\_email)  
   Address(address, region\_name)  
   Decomposed Customers from initial relational schema to 2NF. Region\_name could be found from just cust\_address. Same address relation as from earlier.
8. Garbage\_vehicle (vehicle#, vehicleType, siteID#, supplier\_name)
9. Pickup\_fulfilled (emp#, vehicle#, order#)
10. Pickup\_order (order#, start\_date, garbage\_type, recurring, customerID, dumpsite#)
11. Completed\_Pickups(completed\_date, order#)
12. Office\_staff (SS#, emp#, firstname, lastname, email, emp\_address, emp\_tel\_no, department, siteID#)
13. Field\_staff (SS#, emp#, firstname, lastname, email, emp\_address, emp\_tel\_no, license#, siteID#)
14. Suppliers (supplier\_name, supplier\_telNo, type\_offered, vehicle\_price)

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| --- |
| siteID# → address |
| dumpsite# → region\_name |
| vehicle# → vehicleType, siteID#, supplier\_name |
| order# → start\_date, garbage\_type, recurring, customerID |
| customerID → cust\_firstname, cust\_lastname, cust\_address, cust\_tel\_no, cust\_email |
| Supplier\_name → supplier\_telNo, type\_offered, vehicle\_price |
| emp# → firstname, lastname, emp\_email, emp\_address, emp\_tel\_no, license#, department, SS#, siteID# |
| SS# → firstname, lastname, emp\_email, emp\_address, emp\_tel\_no, license#, department, emp#, siteID# |
| vehicle# → region\_name |
| order# → region\_name |
| order#, completed\_date → vehicle#, emp#, site#, dumpsite#, region\_name |
| address → region\_name |

Using the decomposition algorithm for 3NF, we get:

1. **Address\_Region**(address, region\_name)
2. **Orders\_Completed**(order#, completed\_date, vehicle#, emp#, site#, dumpsite#, region\_name)
3. **Employee**(emp#, firstname, lastname, emp\_email, emp\_address, emp\_tel\_no, license#, deparment, siteID#, SS#)
4. **Supplier**(supplier\_name, supplier\_telNo, type\_offered, vehicle\_price)
5. **Customer**(customerID, cust\_firstname, cust\_lastname, cust\_address)
6. **Orders**(order#, start\_date, garbage\_type, recurring, custID)
7. **Vehicles**(vehicle#, vehicle\_type, supplier\_name, siteID#)
8. **Dumpsite**(dumpsite#, region\_name)
9. **Company(**siteID#, address)

