1. **Database Normalization Evaluation**

The created database is in 3NF, as I have evaluated every table in my database and determined that each table has a primary key and there is not any tables of any repeating attributes or repeating loops. Also, there’s no table containing partial or transitive dependencies.

1NF: All tables are in 1NF as all attributes of each table are single valued. For example, for Customer table, if we have a customer that has multiple phone numbers, we are going to have two separate rows for that same customer, having the same information except for the T\_CustomerPhoneNumber\_CU column, it will have different value for each phone number.

2NF: Since a partial dependency can exist only if a table's primary key is composed of several attributes and since all tables are in 1NF (as proved above) and have a single-attribute primary key (except for EmployeeSkill, ProjectSchedule, TaskSkill tables), then all tables are automatically in 2NF. EmployeeSkill, ProjectSchedule, TaskSkill are also still in 2NF because all of their non key attributes are fully functionally dependent on the primary key. So for ProjectSchedule table, D\_TaskStartDate\_PS and D\_TaskEndDate\_PS attributes are fully dependent on both C\_ProjectID\_PS and C\_TaskID\_PS primary keys not just on one of them. Similarly, for TaskSkill table, I\_QuantityRequired\_TS attributes are fully dependent on on both C\_SkillID\_TS and C\_TaskID\_TS primary keys. Lastly, for EmployeeSkill table, since it doesn’t have any non-primary attributes and all it has just C\_EmployeeID\_ES and C\_SkillID\_ES primary keys columns, it’s automatically in 2NF.

3NF: There is not any table containing transitive dependencies.

1. **SQL DDL**

*--Region*

**CREATE** **TABLE** Region

(

C\_RegionID\_RG INT **PRIMARY** **KEY**,

T\_RegionName\_RG VARCHAR(50) **NOT** **NULL**,

T\_RegionCode\_RG VARCHAR(2) **NOT** **NULL**

);

*--Employee*

**CREATE** **TABLE** Employee

(

C\_EmployeeID\_EP INT **PRIMARY** **KEY**,

T\_LastName\_EP VARCHAR(50) **NOT** **NULL**,

T\_MiddleInitial\_EP VARCHAR(2),

T\_FirstName\_EP VARCHAR(50) **NOT** **NULL**,

D\_HireDate\_EP DATETIME **NOT** **NULL**,

C\_RegionID\_EP INT **NOT** **NULL** **CONSTRAINT** FK\_RegionID\_EP **REFERENCES** Region(C\_RegionID\_RG)

);

*--Skill*

**CREATE** **TABLE** Skill

(

C\_SkillID\_SK INT **PRIMARY** **KEY**,

T\_SkillDescription\_SK VARCHAR(100) **NOT** **NULL**,

N\_PayRate\_SK NUMBER **NOT** **NULL**

);

*--EmployeeSkill*

**CREATE** **TABLE** EmployeeSkill

(

C\_EmployeeID\_ES INT **NOT** **NULL** **CONSTRAINT** FK\_EmployeeID\_ES **REFERENCES** Employee(C\_EmployeeID\_EP),

C\_SkillID\_ES INT **NOT** **NULL** **CONSTRAINT** FK\_SkillID\_ES **REFERENCES** Skill(C\_SkillID\_SK),

**PRIMARY** **KEY**(C\_EmployeeID\_ES, C\_SkillID\_ES)

);

*--Customer*

**CREATE** **TABLE** Customer

(

C\_CustomerID\_CU INT **PRIMARY** **KEY**,

T\_CustomerName\_CU VARCHAR(200) **NOT** **NULL**,

T\_CustomerPhoneNumber\_CU VARCHAR(50) **NOT** **NULL**,

C\_RegionID\_CU INT **NOT** **NULL** **CONSTRAINT** FK\_RegionID\_CU **REFERENCES** Region(C\_RegionID\_RG)

);

*--Project*

**CREATE** **TABLE** Project

(

C\_ProjectID\_PJ INT **PRIMARY** **KEY**,

T\_ProjectDescription\_PJ VARCHAR(255) **NOT** **NULL**,

D\_ProjectContractDate\_PJ DATETIME,

D\_ProjectEstimatedStartDate\_PJ DATETIME,

D\_ProjectEstimatedEndDate\_PJ DATETIME,

N\_ProjectEstimatedBudget\_PJ NUMBER,

D\_ProjectActualStartDate\_PJ DATETIME,

D\_ProjectActualEndDate\_PJ DATETIME,

N\_ProjectActualCost\_PJ NUMBER,

C\_CustomerID\_PJ INT **NOT** **NULL** **CONSTRAINT** FK\_CustomerID\_PJ **REFERENCES** Customer(C\_CustomerID\_CU),

C\_EmployeeID\_PJ INT **NOT** **NULL** **CONSTRAINT** FK\_EmployeeID\_PJ **REFERENCES** Employee(C\_EmployeeID\_EP)

);

*--Task*

**CREATE** **TABLE** Task

(

C\_TaskID\_TK INT **PRIMARY** **KEY**,

T\_TaskDescription\_TK VARCHAR(255) **NOT** **NULL**

);

*--Project Schedule*

**CREATE** **TABLE** ProjectSchedule

(

C\_ProjectID\_PS INT **NOT** **NULL** **CONSTRAINT** FK\_ProjectID\_PS **REFERENCES** Project(C\_ProjectID\_PJ),

C\_TaskID\_PS INT **NOT** **NULL** **CONSTRAINT** FK\_TaskID\_PS **REFERENCES** Task(C\_TaskID\_TK),

D\_TaskStartDate\_PS DATETIME,

D\_TaskEndDate\_PS DATETIME,

**PRIMARY** **KEY**(C\_ProjectID\_PS, C\_TaskID\_PS)

);

*--TaskSkill*

**CREATE** **TABLE** TaskSkill

(

C\_SkillID\_TS INT **NOT** **NULL** **CONSTRAINT** FK\_SkillID\_TS **REFERENCES** Skill(C\_SkillID\_SK),

C\_TaskID\_TS INT **NOT** **NULL** **CONSTRAINT** FK\_TaskID\_TS **REFERENCES** Task(C\_TaskID\_TK),

I\_QuantityRequired\_TS INT **NOT** **NULL**,

**PRIMARY** **KEY**(C\_SkillID\_TS, C\_TaskID\_TS)

);

*--Assignment*

**CREATE** **TABLE** **Assignment**

(

C\_AssignmentID\_AS INT **PRIMARY** **KEY**,

C\_EmployeeID\_AS INT **NOT** **NULL** **CONSTRAINT** FK\_EmployeeID\_AS **REFERENCES** Employee(C\_EmployeeID\_EP),

C\_TaskID\_AS INT **NOT** **NULL** **CONSTRAINT** FK\_TaskID\_AS **REFERENCES** Task(C\_TaskID\_TK),

D\_AssignmentStartDate\_AS DATETIME,

D\_AssignmentEndDate\_AS DATETIME

);

*--Bill*

**CREATE** **TABLE** Bill

(

C\_BillID\_BL INT **PRIMARY** **KEY**,

N\_TotalHoursWorked\_BL NUMBER,

D\_PeriodStartDate\_BL DATETIME,

D\_PeriodEndDate\_BL DATETIME

);

*--Work Log*

**CREATE** **TABLE** WorkLog

(

C\_WorkLogID\_WL INT **PRIMARY** **KEY**,

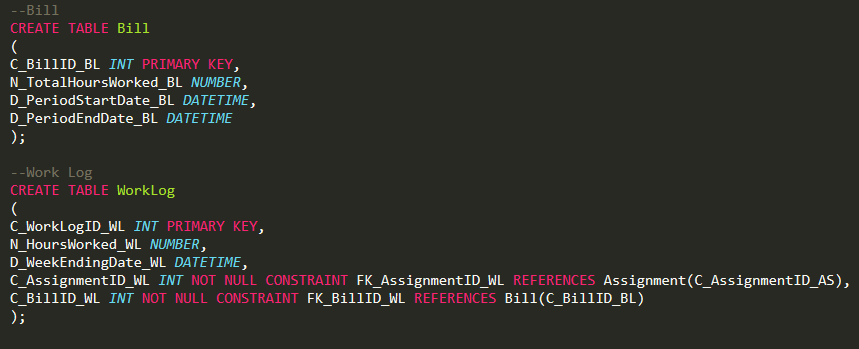
N\_HoursWorked\_WL NUMBER,

D\_WeekEndingDate\_WL DATETIME,

C\_AssignmentID\_WL INT **NOT** **NULL** **CONSTRAINT** FK\_AssignmentID\_WL **REFERENCES** **Assignment**(C\_AssignmentID\_AS),

C\_BillID\_WL INT **NOT** **NULL** **CONSTRAINT** FK\_BillID\_WL **REFERENCES** Bill(C\_BillID\_BL)

);



1. **Screenshots of the Database in Access DBMS**

