IT214 Database Project :
Group G3_7 : Water Supply Management

Group Members :

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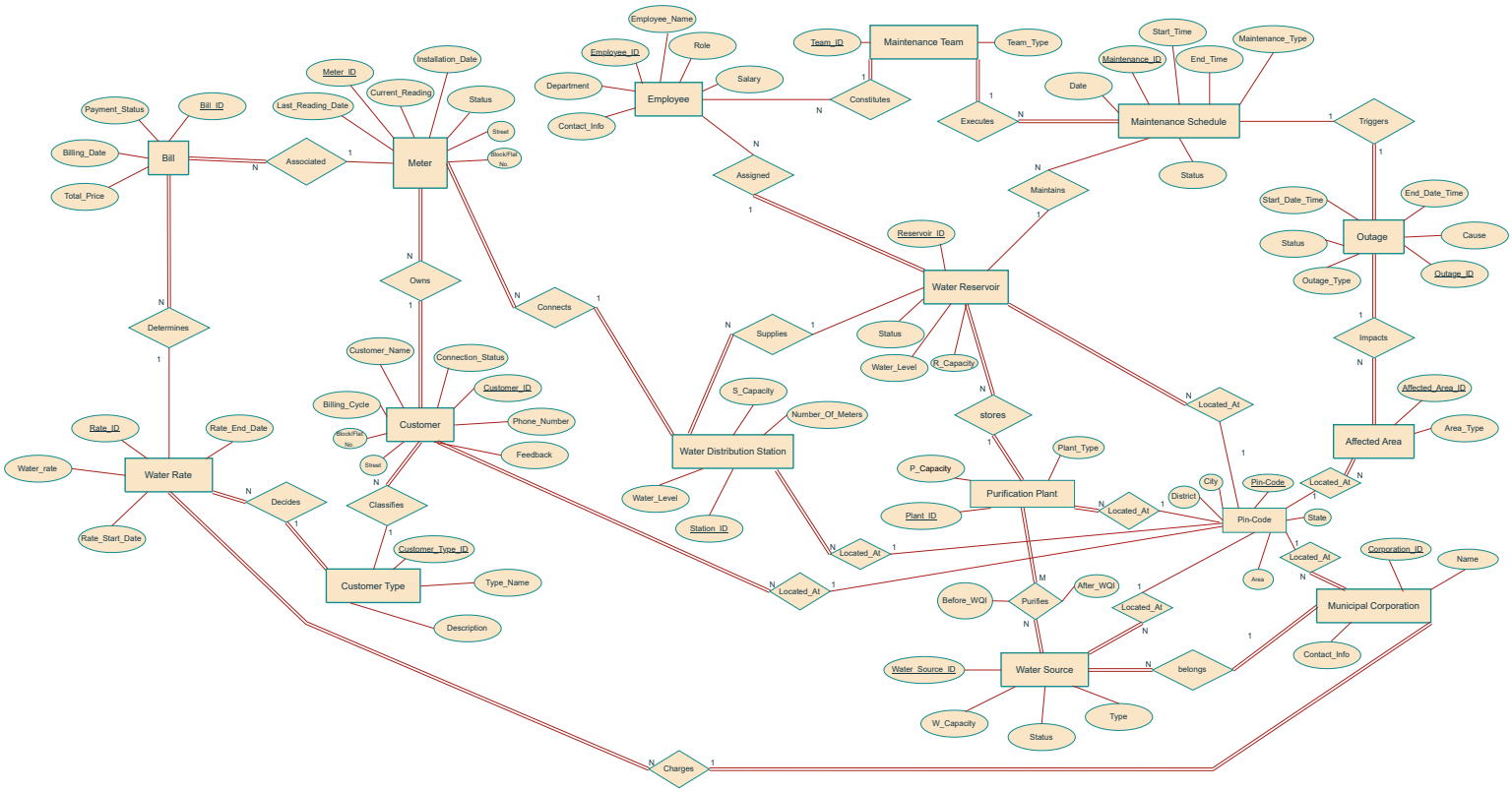
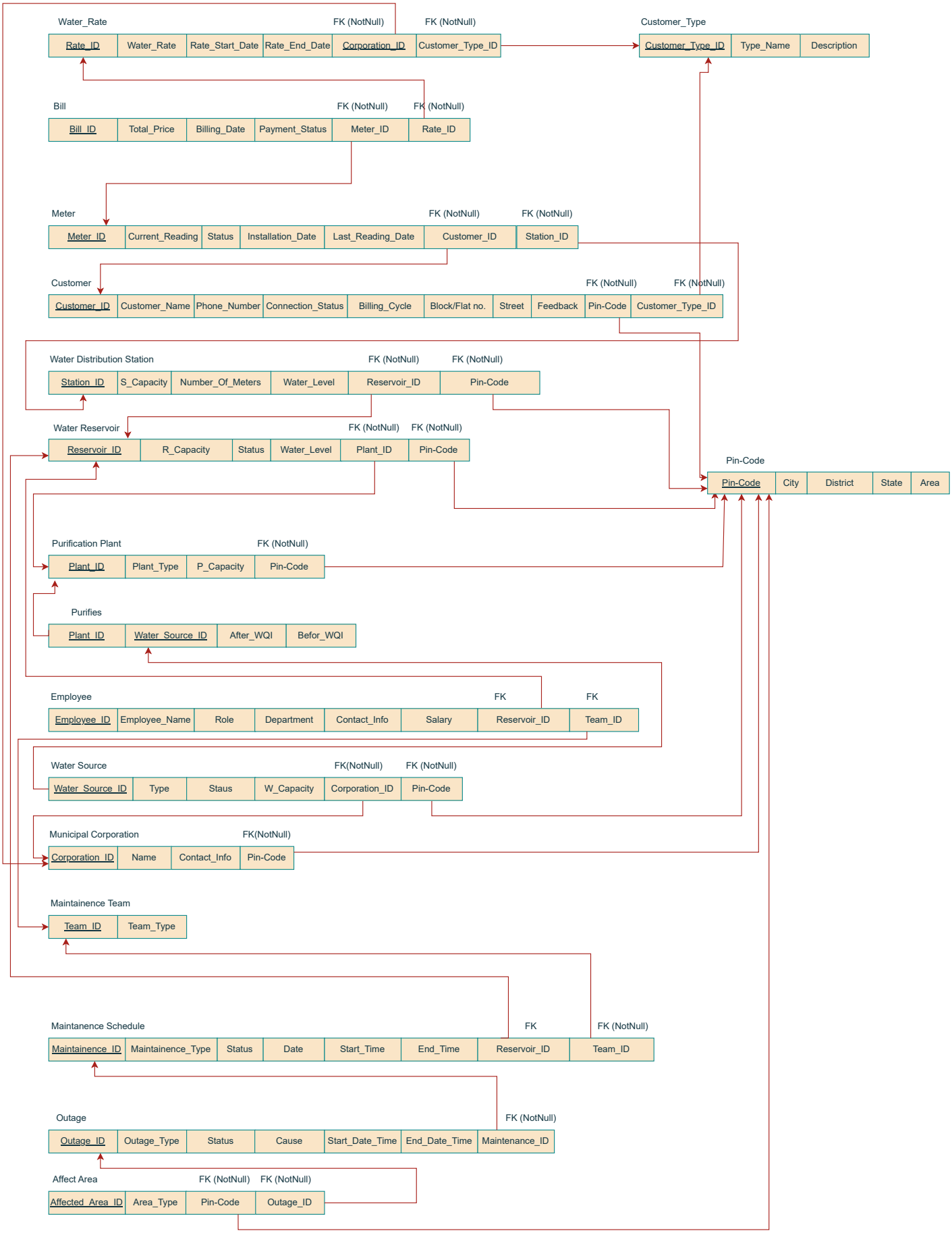
This submission includes following :
(1) ERD
(2) Relational schema with normalization proof.


Employee_Name
Employee_ID
Role
Department
Salary
Contact_Info
Employee
Team_ID
Maintenance Team
Team_Type
Constitutes
Start_Time
Maintenance_Type
Maintenance_ID
End_Time
Date
Executes
Maintenance Schedule
Triggers
Status
Assigned
Maintains
Start_Date_Time
End_Date_Time
Outage
Status
Cause
Outage_Type
Outage_ID
Impacts
Payment_Status
Bill_ID
Billing_Date
Total_Price
Bill
Associated
Meter_ID
Installation_Date
Current_Reading
Last_Reading_Date
Status
Street
Block/Flat No.
Meter
Owns
Connects
Determines
Reservoir_ID
Water Reservoir
Supplies
Status
Water_Level
R_Capacity
Located_At
Affected_Area_ID
Area_Type
Affected Area
Customer_Name
Connection_Status
Customer_ID
Billing_Cycle
Block/Flat No.
Street
Customer
Phone_Number
Feedback
S_Capacity
Number_Of_Meters
Water Distribution Station
Water_Level
Station_ID
stores
Plant_Type
P_Capacity
Plant_ID
Purification Plant
Located_At
City
District
Pin-Code
State
Area
Pin-Code
Located_At
Located_At
Rate_ID
Rate_End_Date
Water_rate
Rate_Start_Date
Water Rate
Decides
Classifies
Customer_Type_ID
Type_Name
Description
Customer Type
Located_At
Before_WQI
Purifies
After_WQI
Located_At
Corporation_ID
Name
Municipal Corporation
Contact_Info
Water_Source_ID
Water Source
belongs
W_Capacity
Status
Type
Charges


Water_Rate
FK (NotNull)
FK (NotNull)
Rate_ID
Water_Rate
Rate_Start_Date
Rate_End_Date
Corporation_ID
Customer_Type_ID
Customer_Type
Customer_Type_ID
Type_Name
Description
Bill
FK (NotNull)
FK (NotNull)
Bill_ID
Total_Price
Billing_Date
Payment_Status
Meter_ID
Rate_ID
Meter
FK (NotNull)
FK (NotNull)
Meter_ID
Current_Reading
Status
Installation_Date
Last_Reading_Date
Customer_ID
Station_ID
Customer
FK (NotNull)
FK (NotNull)
Customer_ID
Customer_Name
Phone_Number
Connection_Status
Billing_Cycle
Block/Flat no.
Street
Feedback
Pin-Code
Customer_Type_ID
Water Distribution Station
FK (NotNull)
FK (NotNull)
Station_ID
S_Capacity
Number_Of_Meters
Water_Level
Reservoir_ID
Pin-Code
Water Reservoir
FK (NotNull)
FK (NotNull)
Reservoir_ID
R_Capacity
Status
Water_Level
Plant_ID
Pin-Code
Pin-Code
Pin-Code
City
District
State
Area
Purification Plant
FK (NotNull)
Plant_ID
Plant_Type
P_Capacity
Pin-Code
Purifies
Plant_ID
Water_Source_ID
After_WQI
Befor_WQI
Employee
FK
FK
Employee_ID
Employee_Name
Role
Department
Contact_Info
Salary
Reservoir_ID
Team_ID
Water Source
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FK (NotNull)
Water_Source_ID
Type
Staus
W_Capacity
Corporation_ID
Pin-Code
Municipal Corporation
FK(NotNull)
Corporation_ID
Name
Contact_Info
Pin-Code
Maintainence Team
Team_ID
Team_Type
Maintanence Schedule
FK
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Maintainence_ID
Maintainence_Type
Status
Date
Start_Time
End_Time
Reservoir_ID
Team_ID
Outage
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Outage_ID
Outage_Type
Status
Cause
Start_Date_Time
End_Date_Time
Maintenance_ID
Affect Area
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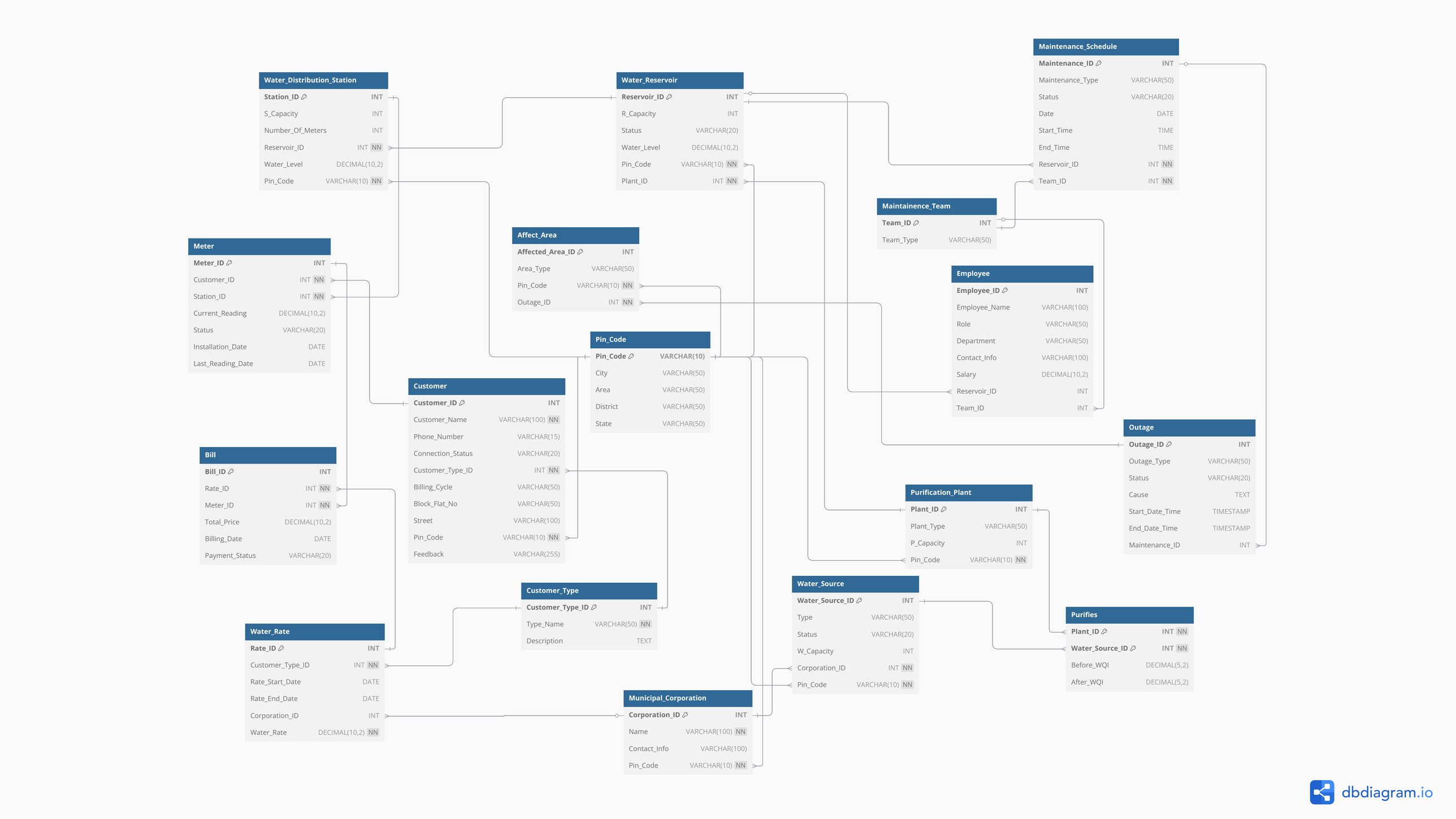
FK (NotNull)
Affected_Area_ID
Area_Type
Pin-Code
Outage_ID



Normalization proof for all relations (all relations are in BCNF).

Customer

FDs

Customer_ID → {Customer_Name, Phone_Number, Billing_Cycle, Block/Flate_No, Street, Connection_Status, Feedback, Customer_Type_ID, Pin-Code}

BCNF Check

The FD has the candidate key as its determinant, so the relation is in BCNF.

Customer Type

FDs

Customer_Type_ID → {Type_Name, Description}

BCNF Check

The FD has the candidate key as its determinant, so the relation is in BCNF.

Bill

FDs

Bill_ID → {Billing_Date, Total_Price, Payment_Status, Meter_ID, Rate_ID}

BCNF Check

The FD has the candidate key as its determinant, so the relation is in BCNF.

Meter

FDs

Meter_ID → {Current_Reading, Installation_Date, Status, Last_Reading_Date, Customer_ID, Station_ID}

BCNF Check

The FD has the candidate key as its determinant, so the relation is in BCNF.

Water Rate

FDs

Rate_ID → {Customer_Type_ID, Rate_Start_Date, Rate_End_Date, Water_rate, Corporation_ID}

BCNF Check

The FD has the candidate key as its determinant, so the relation is in BCNF.

Water Distribution Station

FDs

Station_ID → {Water_Level, S_Capacity, Number_Of_Meters, Reservoir_ID, Pin-Code}

BCNF Check

The FD has the candidate key as its determinant, so the relation is in BCNF.

Water Reservoir

FDs

Reservoir_ID → {Status, Water_Level,R_Capacity, Plant_ID, Pin-Code}

BCNF Check

The FD has the candidate key as its determinant, so the relation is in BCNF.

Purification Plant

FD

Plant_ID → {P_Capacity, Plant_Type, Pin-Code}

BCNF Check

The FD has the candidate key as its determinant, so the relation is in BCNF.

Purifies (M–N Relationship Table)

FD

{Plant_ID, Water_Source_ID} → { After_WQI, Before_WQI}

BCNF Check

In a junction table where the composite key is the only key, there is no violation of BCNF.

Water Source

FDs

Water_Source_ID → {Type, W_Capacity, Status, Area, Corporation_ID, Pin-Code}

BCNF Check

The FD has the candidate key as its determinant, so the relation is in BCNF.

Municipal Corporation

FDs

Corporation_ID → {Name, Contact_Info, Pin-Code}

BCNF Check

The FD has the candidate key as its determinant, so the relation is in BCNF.

Employee

FDs

Employee_ID → {Employee_Name, Role, Department, Salary, Contact_Info, Team_ID, Reservoir_ID}

BCNF Check

The FD has the candidate key as its determinant, so the relation is in BCNF.

Outage

FDs

Outage_ID → {Start_Date_Time, End_Date_Time, Status, Outage_Type, Cause, Maintenance_ID}

BCNF Check

The FD has the candidate key as its determinant, so the relation is in BCNF.

Affected Area

FDs

Affected_Area_ID → {Area_Type, Outage_ID, Pin-Code}

BCNF Check

The FD has the candidate key as its determinant, so the relation is in BCNF.

Maintenance Team

FD

Team_ID → {Team_Type}

BCNF Check

The FD has the candidate key as its determinant, so the relation is in BCNF.

Maintenance Schedule

FD:

Maintenance_ID → {Date, Start_Time, End_Time, Maintenance_Type, Status, Team_ID, Reservoir_ID}

BCNF Check

The FD has the candidate key as its determinant, so the relation is in BCNF.

Pin-Code

FD

Pin_Code → {City, State, District, Area}

BCNF Check

The FD has the candidate key as its determinant, so the relation is in BCNF.

Overall BCNF Check:

All the **Functional Dependencies** we've listed have the **LHS as a superkey — no partial or transitive dependencies with non-superkeys**, and no composite candidate keys being violated by a dependency.

Thus it is BCNF.