Relational Database Model for a Construction Company

1. Introduction

A relational database is a type of database that stores data in structured tables (relations) consisting of rows (records) and columns (attributes). Each table represents an entity in the real world, and relationships among tables are established using keys. Relational databases are widely used in business applications because they provide data integrity, consistency, and ease of querying.

In the context of a construction company, a relational database helps manage complex operations, including project management, employee assignments, material and equipment usage, client and supplier details, and financial tracking. By organizing data efficiently, the company can improve decision-making, reduce errors, and streamline operations.

2. Key Entities in a Construction Company Database

1. **Projects –** Stores information about construction projects.
   Attributes: ProjectID (PK), ProjectName, ProjectType, Location, StartDate, EndDate, Budget, Status.
2. **Clients –** Contains information about people or organizations commissioning projects.
   Attributes: ClientID (PK), Name, ContactNumber, Email, Address.
3. **Employees –** Details about employees working in various projects.
   Attributes: EmployeeID (PK), Name, Position, ContactNumber, Email, Salary, Department.
4. **Suppliers –** Companies providing materials or equipment.
   Attributes: SupplierID (PK), Name, ContactNumber, Email, Address, MaterialProvided.
5. **Materials –** Construction materials used in projects.
   Attributes: MaterialID (PK), MaterialName, MaterialType, UnitPrice, QuantityAvailable.
6. **Equipment –** Machines and tools used in construction.
   Attributes: EquipmentID (PK), EquipmentName, Type, RentalCost, Status.

7. **ProjectAssignments –** Tracks employees assigned to projects.
   Attributes: AssignmentID (PK), ProjectID (FK), EmployeeID (FK), Role, HoursAssigned.
8. **ProjectMaterials –** Tracks materials used in each project.
   Attributes: ProjectMaterialID (PK), ProjectID (FK), MaterialID (FK), QuantityUsed.
9. **ProjectEquipment –** Tracks equipment assigned to projects.
   Attributes: ProjectEquipmentID (PK), ProjectID (FK), EquipmentID (FK), UsageDuration.
10. **Invoices/Payments –** Tracks financial transactions for projects.
    Attributes: InvoiceID (PK), ProjectID (FK), ClientID (FK), Amount, PaymentDate, PaymentStatus.

3. Relationships

- **Client ↔ Project**

  One client can have multiple projects (1:N).

- **Project ↔ Employee**

  Employees can work on multiple projects, and a project can have multiple employees (M:N) – managed via ProjectAssignments.

- **Project ↔ Material**

  Projects can use multiple materials; materials can be used in multiple projects (M:N) – managed via ProjectMaterials.

- **Project ↔ Equipmen**

  Projects can use multiple equipment; equipment can be used in multiple projects (M:N) – managed via ProjectEquipment.

- **Supplier ↔ Material**

  One supplier can supply multiple materials (1:N).

- **Project ↔ Invoice**

  One project can have multiple invoices (1:N).