**CIST 3222 DATABASE SYSTEMS**

**GROUP PROJECT REPORTS**

Coastal Land Contractors, Inc.

Group 3

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**Project Overview**

**1. Executive Summary:**

The business we created the database for, Coastal Land Contractors, is a family-run contracting company that does small-scale construction work, mainly in New Jersey. They are often hired by schools and other public institutions to tear down or replace flooring, ceiling components, and walls. Because the company was founded well before computers were affordable for small business and the company has relatively few employees, most of the company’s records about their vehicles, equipment, and clients are kept on paper. They have not had the time or the resources to move their records to a digital format. This has resulted in relatively subpar organization of their records and extra time needed to be spent searching through them when needed.

To help resolve this issue, our group created a database for the company to use. This will allow them to have quick access to data on many of their most important records. They will be able to track the locations and conditions of their equipment, vehicles, and materials. They will also have data on their employees, their clients, and any jobs the company is currently working on or has worked on previously. This will all help them more easily determine when they need to service or replace anything.

**2. Who did What:**

Timothy Sands found a business to make a database for, came up with the initial designs of the tables and their primary keys, created the Phase 1 Project Report, wrote SQL commands to insert the sample data into the final versions of the tables, reviewed the Meeting Minutes forms, and helped with the Final Project Report.

Leonardo Acefe created and typed explanations for the tables and the relationships between them for both the Phase 1 and Final Project Reports, typed a list of the functional dependencies within the tables, created the PowerPoint presentation for the project, reviewed the Meeting Minutes forms, and helped with the Final Project Report.

Jay An fixed all of the tables based on the professor’s recommendations, created the Conceptual Data Model and Database Design, submitted a draft for the database design diagram, helped create the final versions of the tables, ran all of the SQL commands written by the group, wrote the Meeting Minutes for each meeting, and helped with the Final Project Report.

Long Nguyen fixed the tables as necessary, created a draft of the Entity Relationship Diagram, reviewed and corrected any issues with the Phase 1 Project Report, helped create the final versions of the tables, reviewed the Meeting Minutes forms, and helped with the Final Project Report.

**3. Table of Contents:**

Business Description……………………………………………………………………………....4

Name of the Business………………………………….…………………………………..4

Purpose of the Business…………………………………………………………………...4

Summary of Business Activities………………………………………………………......4

Problems, Opportunities, and Objectives………………………………………………….4

Business Case…………………………………………………………………….………..5

Information and Data Requirement……………………………………………………….5

List of Entities……………………………………………………………………………..5 Conceptual Data Model……………………………………………………………………..…….7

Entity Relationship Diagram………………….…………………………………………..7 Database Design …………………………………………………………………………………..9

E-R Model into Relationship Model……………………………………………..………..9

List of Functional Dependencies………………………………………………………...10 Database Implementation…………………………………………………………………...……12

SQL Codes for Normalized Table…………………………………………………….....12

SQL Codes for Inserting Data……………………………………………………………17

Relationship View………………………………………………………………………..22

**Business Description**

**1. Name of the Business:** Coastal Land Contractors, Inc.

**2. Purpose of the Business:** Coastal Land Contractors is a small business that does various types of construction work.

**3. Summary of Business Activities:** As mentioned previously, the business does various types of construction work including but not limited to redoing ceilings, knocking out walls, and adding new rooms to buildings.

**4. Problems, Opportunities, and Objectives:**

**Problems:** The problem the business faces is that most of the information about their

equipment and materials is recorded solely on paper. They do not have many digital

records aside from financial records for employees. This can make organization of their

records very difficult and require extra time to be used to search through their data to

come up with the information they need.

**Opportunities:** By having quickly access to data on equipment, materials, and any other

important records, the company will be able to spend less time gathering the information

they need. This will allow them to focus more on their clients when need and complete

jobs more efficiently as well as keep better track of when their vehicles, equipment, and

materials need to be serviced or replaced.

**Objectives:** The company’s new database will allow them to access data on vehicles,

equipment, materials, jobs, clients, and employees as quickly and conveniently as

possible. This will make it much easier for the company to keep track of where vehicles,

equipment, and materials are located, which employees are assigned to which jobs, what

materials need to be purchased or sent to which jobs, and a lot of other valuable

information.

**5. Business Case:** The new database system should help the business work more efficiently by saving time that would otherwise be spent searching through paper records.

**6. Information and Data Requirement:**

The data that will be required are ‘Vehicles’, ‘Equipment’, ‘Materials’, ‘Jobs’, ‘Job Materials’, ‘Clients’, ‘Employees’, ‘Employee Vehicles’, and ‘Job Equipment’.

The information that will be generated will include ‘Mileage to Next Service’, ‘Materials to Purchase’, ‘Equipment to Purchase’, ‘Estimated Cost High to Low’, and ‘Estimated Cost Low to High’.

The most recent data on the Mileage of a Vehicle will be used to determine the Mileage to Next Service for a Vehicle. Services will be assumed to take place every 7,500 miles. Materials to Purchase will be determined through the relationship between Materials and Job Materials. If there is a less of a given material than a job demands, the company will need to purchase more. Equipment to Purchase will be determined by the condition of all current equipment. Estimated Cost High to Low and Estimated Cost Low to High will be determined by the Estimated Cost of each Job that is not yet Completed.

**7. List of Entities (Tables) and Columns in Tables:**

VEHICLE(VIN, Year, Make, Model, Mileage, Type)

EQUIPMENT(EquipmentID, Description, Condition)

MATERIALS(MaterialID, MaterialName, QuantityOnHand, Manufacturer, Price)

JOBS(JobID, ClientID, EmployeeWorking, EstimatedCost, FinalCost, Description, Location)

JOB\_MATERIALS(JobID, MaterialID, Quantity)

CLIENTS(ClientID, LastName, FirstName, Company, PhoneNumber, Street, City, State, Zip)

EMPLOYEES(EmployeeID, LastName, FirstName, DailyWage, HireDate, PhoneNumber)

EMPLOYEE\_VEHICLES(EmployeeID, VIN, AssignDate)

JOB\_EQUIPMENT(EquipmentID, JobID, CheckOut, CheckIn)

**Conceptual Data Model**

**1. Entity Relationship Diagram**

Diagram

Description automatically generated

(EMPLOYEES to VEHICLE) An employee, identified by a unique EmployeeID, can operate a Vehicle for use during construction, identified by a unique VIN. However, not all employees must operate a Vehicle, and there will be Vehicles which are not in use by any Employee at any given time. Therefore, their relationship is many-to-many and optional-to-optional.

(EMPLOYEES to JOBS) Employees, identified by a unique EmployeeID, must be present at a job site, identified by a unique JobID. Employees may work on multiple projects, but these projects must have at least one employee registered to work them at any given time. Therefore, their relationship is one-to-many and mandatory-to-mandatory.

(JOBS to EQUIPMENT) Jobs, identitifed by a unique JobID, may need the use of construction Equipment, identified by a unique EquipmentID. A given job may require multiple vehicles, and a given vehicle could be shared among multiple jobs. Therefore, their relationship is many-to-many and optional-to-optional.

(JOBS to MATERIALS) Jobs, identified by a unique JobID, require the use of Materials, identified by a unique MaterialID, to be completed. Without the use of materials, no construction job can be worked on, and the materials will remain unused until a job requires their use. Materials can be shared among multiple jobs, and jobs can require the use of many materials. Therefore, their relationship is many-to-many and mandatory-to-mandatory.

(CLIENTS to JOBS) Jobs, identified by a unique JobID, are described by the demands of the Clients, indentified by a unique ClientID. Clients may request multiple jobs to be completed under their name, but these jobs will always track back to only one specific client. A client must request a job to be considered a client, and a job will only be considered valid when there is a client requesting them. Therefore, their relationship is one-to-many, and mandatory-to-mandatory.

**Database Design**

**1. E-R Model into Relationship Model**

Diagram

Description automatically generated

(EMPLOYEE\_VEHICLES) EMPLOYEE\_VEHICLES contains foreign keys from EMPLOYEES and VEHICLE, meaning that they are the parents to this table. From EMPLOYEES, the foreign key is EMPID\_VECH\_FK. From VEHICLE, the foreign key is EMP\_VIN\_FK.

(CLIENTS) CLIENTS acts as the parent to JOBS, through the use of the JOBS\_CLIENT\_FK foreign key.

(JOB\_MATERIALS) MATERIALS is the parent of the JOB\_MATERIALS table through the JOB\_MAT\_FK foreign key.

(JOB\_EQUIPMENT) EQUIPMENT is the parent of the JOB\_EQUIPMENT table through the JOB\_EQU\_FK foreign key.

(JOBS) JOBS is the parent of the JOB\_EQUIPMENT table through the JOB\_EQU\_FK2 foreign key and the JOB\_MATERIALS tables through the JOB\_MAT\_FK2 foreign key.

**2. List of Functional Dependencies**

EMPLOYEES

EmployeeID -> (LastName, FirstName, DailyWage, HireDate, PhoneNumber)

JOBS

JobID -> (ClientID, EmployeeWorking, EstimatedCost, FinalCost, Description, Location)

EQUIPMENT

EquipmentID -> (Description, Location)

JOB\_EQUIPMENT

EquipmentID -> (CheckOut, CheckIn)

CLIENTS

ClientID -> (LastName, FirstName, Company, PhoneNumber, Street, City, State, Zip)

Zip -> (City, State)

JOB\_MATERIALS

MaterialID -> Quantity

MATERIALS

MaterialID -> (MaterialName, Quantity, Manufacturer, Price)

VEHICLE

VIN -> (Year, Make, Model, Mileage, Type)

EMPLOYEES\_VEHICLES

(EmployeeID,VIN) -> AssignDate

**Database Implementation**

**1. SQL Codes for Creating All Tables**

CREATE TABLE CLIENTS(

ClientID Int NOT NULL,

LastName VARCHAR(255) NOT NULL,

FirstName VARCHAR(255) NOT NULL,

COMPANY VARCHAR(255) NULL,

PhoneNumber Number(10) NOT NULL,

Street VARCHAR(255) NOT NULL,

City VARCHAR(255) NOT NULL,

State Char(2) NOT NULL,

ZIP Number(10) NOT NULL,

CONSTRAINT ClientID\_PK PRIMARY KEY(ClientID)

);

CREATE TABLE EMPLOYEES(

EmployeeID Int NOT NULL,

LastName VARCHAR(255) NOT NULL,

FirstName VARCHAR(255) NOT NULL,

DailyWage Number NOT NULL,

HireDate Date NOT NULL,

PhoneNumber Number(10) NOT NULL,

CONSTRAINT EmployeeID\_PK PRIMARY KEY(EmployeeID)

);

CREATE TABLE VEHICLE(

VIN VARCHAR(255) NOT NULL,

Year NUMBER(4) NOT NULL,

Make VARCHAR(255) NOT NULL,

Model VARCHAR(255) NOT NULL,

Mileage NUMBER(10) NOT NULL,

Type VARCHAR(255) NOT NULL,

CONSTRAINT VIN\_PK PRIMARY KEY(VIN)

);

CREATE TABLE EQUIPMENT(

EquipmentID INT NOT NULL,

Description VARCHAR(255) NOT NULL,

Condition VARCHAR(255) NOT NULL,

CONSTRAINT EquipmentID\_PK PRIMARY KEY(EquipmentID)

);

CREATE TABLE MATERIALS(

MaterialID Int NOT NULL,

MaterialName VARCHAR(255) NOT NULL,

QuantityOnHand Number(10) NOT NULL,

Manufacturer VARCHAR(255) NOT NULL,

Price Number(10) NOT NULL,

CONSTRAINT MaterialID\_PK PRIMARY KEY(MaterialID)

);

CREATE TABLE JOBS(

JobID INT NOT NULL,

ClientID INT NOT NULL,

EmployeeWorking INT NOT NULL,

EstimatedCost NUMBER(10) NOT NULL,

FinalCost DECIMAL(10,2) NULL,

Description VARCHAR(255) NOT NULL,

Location VARCHAR(255) NOT NULL,

CONSTRAINT JOBS\_PK PRIMARY KEY(JobID),

CONSTRAINT JOBS\_EMPLOYEE\_FK FOREIGN KEY(EmployeeWorking)

REFERENCES EMPLOYEES(EmployeeID),

CONSTRAINT JOBS\_CLIENT\_FK FOREIGN KEY(ClientID)

REFERENCES CLIENTS(ClientID)

);

CREATE TABLE JOB\_MATERIALS(

JobID INT NOT NULL,

MaterialID INT NOT NULL,

Quantity Number(10) NOT NULL,

CONSTRAINT JOB\_MAT\_PK PRIMARY KEY(JobID, MaterialID),

CONSTRAINT JOB\_MAT\_FK FOREIGN KEY(MaterialID)

REFERENCES MATERIALS(MaterialID),

CONSTRAINT JOB\_MAT\_FK2 FOREIGN KEY(JobID)

REFERENCES JOBS(JobID)

);

CREATE TABLE JOB\_EQUIPMENT(

EquipmentID INT NOT NULL,

JobID INT NOT NULL,

CheckOut DATE Null,

CheckIn DATE Null,

CONSTRAINT JOB\_EQU\_PK PRIMARY KEY(EquipmentID, JobID),

CONSTRAINT JOB\_EQU\_FK FOREIGN KEY(EquipmentID)

REFERENCES Equipment(EquipmentID),

CONSTRAINT JOB\_EQU\_FK2 FOREIGN KEY(JobID)

REFERENCES JOBS(JobID)

);

CREATE TABLE Employee\_Vehicles(

EmployeeID Int NOT NULL,

VIN VARCHAR(255) NOT NULL,

AssignDate Date NULL,

CONSTRAINT EmpID\_VIN\_PK PRIMARY KEY(EmployeeID, Vin),

CONSTRAINT EmpID\_Vech\_FK FOREIGN KEY(EmployeeID)

REFERENCES EMPLOYEES(EmployeeID),

CONSTRAINT Emp\_VIN\_FK FOREIGN KEY(VIN)

REFERENCES VEHICLE(VIN)

);

**2. SQL Codes for Inserting Data**

INSERT INTO CLIENTS (ClientID, LastName, FirstName, Company, PhoneNumber, Street, City, State, ZIP)

VALUES(1, 'Johnson', 'Yvette', 'Schalick High School', 8563582054, '718 Centerton Road', 'Pittsgrove', 'NJ', 08318);

INSERT INTO CLIENTS (ClientID, LastName, FirstName, Company, PhoneNumber, Street, City, State, ZIP)

VALUES(2, 'Williams', 'Steven', 'Upper Township Middle School', 6096283500, '525 Perry Road', 'Woodbine', 'NJ', 08270);

INSERT INTO CLIENTS (ClientID, LastName, FirstName, Company, PhoneNumber, Street, City, State, ZIP)

VALUES(3, 'Kesselman', 'Harvey', 'Stockton University', 6096521776, '101 Vera King Farris Drive', 'Galloway', 'NJ', 08205);

INSERT INTO CLIENTS (ClientID, LastName, FirstName, Company, PhoneNumber, Street, City, State, ZIP)

VALUES(4, 'Jones', 'Richard', 'Atlantic County Criminal Courts Complex', 6094020100, '4997 Unami Blvd', 'Mays Landing', 'NJ', 08330);

INSERT INTO EMPLOYEES (EmployeeID, LastName, FirstName, DailyWage, HireDate, PhoneNumber)

VALUES (1, 'Rumpp', 'William', 400, date '1970-02-21', 8563587276);

INSERT INTO EMPLOYEES (EmployeeID, LastName, FirstName, DailyWage, HireDate, PhoneNumber)

VALUES (2, 'Rumpp', 'Michael', 350, date '1995-06-25', 8563582314);

INSERT INTO EMPLOYEES (EmployeeID, LastName, FirstName, DailyWage, HireDate, PhoneNumber)

VALUES (3, 'Smith', 'Andy', 350, date '1997-06-19', 8563585347);

INSERT INTO EMPLOYEES (EmployeeID, LastName, FirstName, DailyWage, HireDate, PhoneNumber)

VALUES (4, 'Sands', 'Timothy', 100, date '2019-04-11', 8564055201);

INSERT INTO VEHICLE (VIN, Year, Make, Model, Mileage, Type)

VALUES ('2A4GP54L76R703793', 2005, 'Ford', 'F-150', 182675, 'Pickup Truck');

INSERT INTO VEHICLE (VIN, Year, Make, Model, Mileage, Type)

VALUES ('2GCEC13T751168853', 2017, 'Ford', 'F-150', 39892, 'Pickup Truck');

INSERT INTO VEHICLE (VIN, Year, Make, Model, Mileage, Type)

VALUES ('WBAXH5C54CDW81348', 2019, 'Ford', 'F-150', 51792, 'Pickup Truck');

INSERT INTO VEHICLE (VIN, Year, Make, Model, Mileage, Type)

VALUES ('3N1CN7AP2FL885853', 2018, 'Chevrolet', 'Silverado 1500', 45384, 'Pickup Truck');

INSERT INTO EQUIPMENT (EquipmentID, Description, Condition)

VALUES (1, 'Uline Pallet Jack', 'Very Good');

INSERT INTO EQUIPMENT (EquipmentID, Description, Condition)

VALUES (2, 'Ridgid Gang Box', 'Worn');

INSERT INTO EQUIPMENT (EquipmentID, Description, Condition)

VALUES (3, 'Metaltech Scaffold', 'Good');

INSERT INTO EQUIPMENT (EquipmentID, Description, Condition)

VALUES (4, 'Drywall Cart', 'Very Good');

INSERT INTO MATERIALS (MaterialID, MaterialName, QuantityOnHand, Manufacturer, Price)

VALUES (1, '8 Pack of Ceiling Tile', 20, 'USG', 38.61);

INSERT INTO MATERIALS (MaterialID, MaterialName, QuantityOnHand, Manufacturer, Price)

VALUES (2, 'Caulk', 6, 'DAP', 3.18);

INSERT INTO MATERIALS (MaterialID, MaterialName, QuantityOnHand, Manufacturer, Price)

VALUES (3, '8 Foot 2x4', 53, 'Home Depot', 6.75);

INSERT INTO MATERIALS (MaterialID, MaterialName, QuantityOnHand, Manufacturer, Price)

VALUES (4, '60 Pack of 8 Foot Cross Tees', 5, 'USG', 234.00);

INSERT INTO JOBS (JobID, ClientID, EmployeeWorking, EstimatedCost, FinalCost, Description, Location)

VALUES (1, 2, 2, 5000, 5172.92, 'Knock down right side wall in Room 205', 'Upper Township Middle School');

INSERT INTO JOBS (JobID, ClientID, EmployeeWorking, EstimatedCost, FinalCost, Description, Location)

VALUES (2, 1, 4, 3000, 2859.78, 'Replace ceiling tile in rooms 302 and 303', 'Schalick High School');

INSERT INTO JOBS (JobID, ClientID, EmployeeWorking, EstimatedCost, FinalCost, Description, Location)

VALUES (3, 3, 3, 7000, 7113.98, 'Make repairs to walkway under K wing', 'Stockton University');

INSERT INTO JOBS (JobID, ClientID, EmployeeWorking, EstimatedCost, FinalCost, Description, Location)

VALUES (4, 4, 1, 2000, 2083.54, 'Inspect wall on 3rd floor east hallway for necessary repairs', 'Atlantic County Court');

INSERT INTO JOB\_MATERIALS (JobID, MaterialID, Quantity)

VALUES (2, 1, 15.5);

INSERT INTO JOB\_MATERIALS (JobID, MaterialID, Quantity)

VALUES (2, 4, 1.2);

INSERT INTO JOB\_MATERIALS (JobID, MaterialID, Quantity)

VALUES (3, 2, 2);

INSERT INTO JOB\_MATERIALS (JobID, MaterialID, Quantity)

VALUES (3, 3, 24);

INSERT INTO JOB\_EQUIPMENT (EquipmentID, JobID, CheckOut, CheckIn)

VALUES (2, 1, date '2019-05-17', date '2019-05-29');

INSERT INTO JOB\_EQUIPMENT (EquipmentID, JobID, CheckOut, CheckIn)

VALUES (1, 2, date '2020-01-18', date '2020-01-23');

INSERT INTO JOB\_EQUIPMENT (EquipmentID, JobID, CheckOut, CheckIn)

VALUES (4, 3, date '2021-07-09', date '2021-07-22');

INSERT INTO JOB\_EQUIPMENT (EquipmentID, JobID, CheckOut, CheckIn)

VALUES (3, 4, date '2022-03-01', date '2021-03-03');

INSERT INTO EMPLOYEE\_VEHICLES (EmployeeID, VIN, AssignDate)

VALUES (1, 'WBAXH5C54CDW81348', date '2019-07-12');

INSERT INTO EMPLOYEE\_VEHICLES (EmployeeID, VIN, AssignDate)

VALUES (2, '2GCEC13T751168853', date '2019-07-12');

INSERT INTO EMPLOYEE\_VEHICLES (EmployeeID, VIN, AssignDate)

VALUES (3, '3N1CN7AP2FL885853', date '2018-04-29');

INSERT INTO EMPLOYEE\_VEHICLES (EmployeeID, VIN, AssignDate)

VALUES (4, '2A4GP54L76R703793', date '2019-04-11');

**3. Screenshot of the ER diagram in the SQL Developer**

Diagram

Description automatically generated