

CS50'S INTRODUCTION TO DATABASES WITH SQL FINAL PROJECT

ENGINEERING PROJECT MANAGER DB

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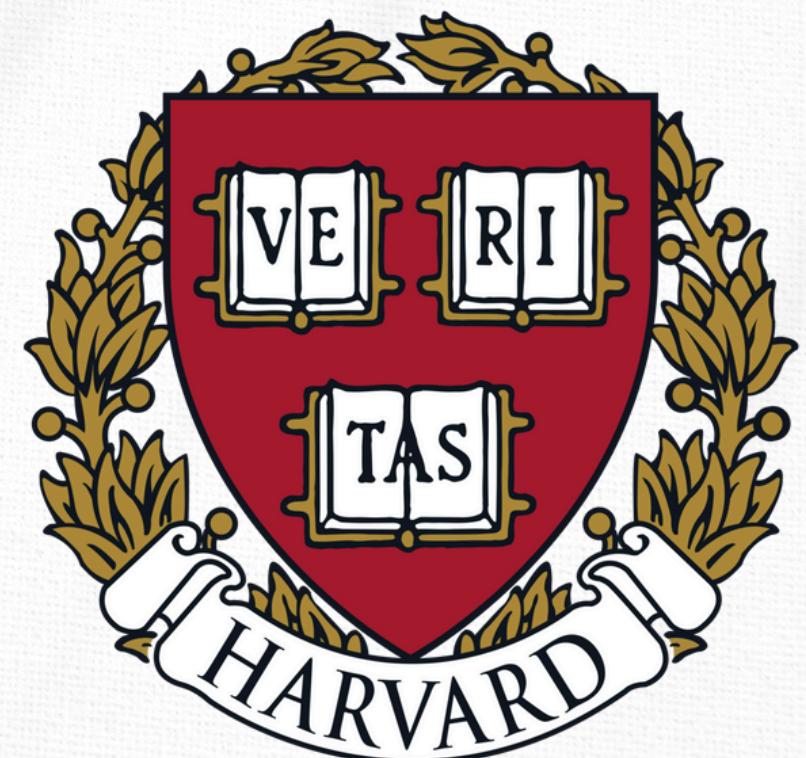
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Objective

The purpose of this database is to manage the operations of an engineering consulting firm, including tracking staff members, clients, project budgets, and the assignment of personnel and equipment to each project. It facilitates administrative control, ensures data integrity, and supports further analysis through tools like Power BI.

Scope

Included:

Staff: engineers, project managers, welder, etc.

Clients: companies or individuals hiring engineering services.

Contacts: specific people linked to each client.

Projects: engineering jobs with location and budget information.

Budgets: quotations for proposed work, including status tracking.

Equipments: physical tools or machines used in projects.

Assignments: which staff and equipment are involved in each project.

Excluded:

Financial transactions: invoices, payments, and accounting.

Detailed task-level project management: Gantt charts, deadlines.

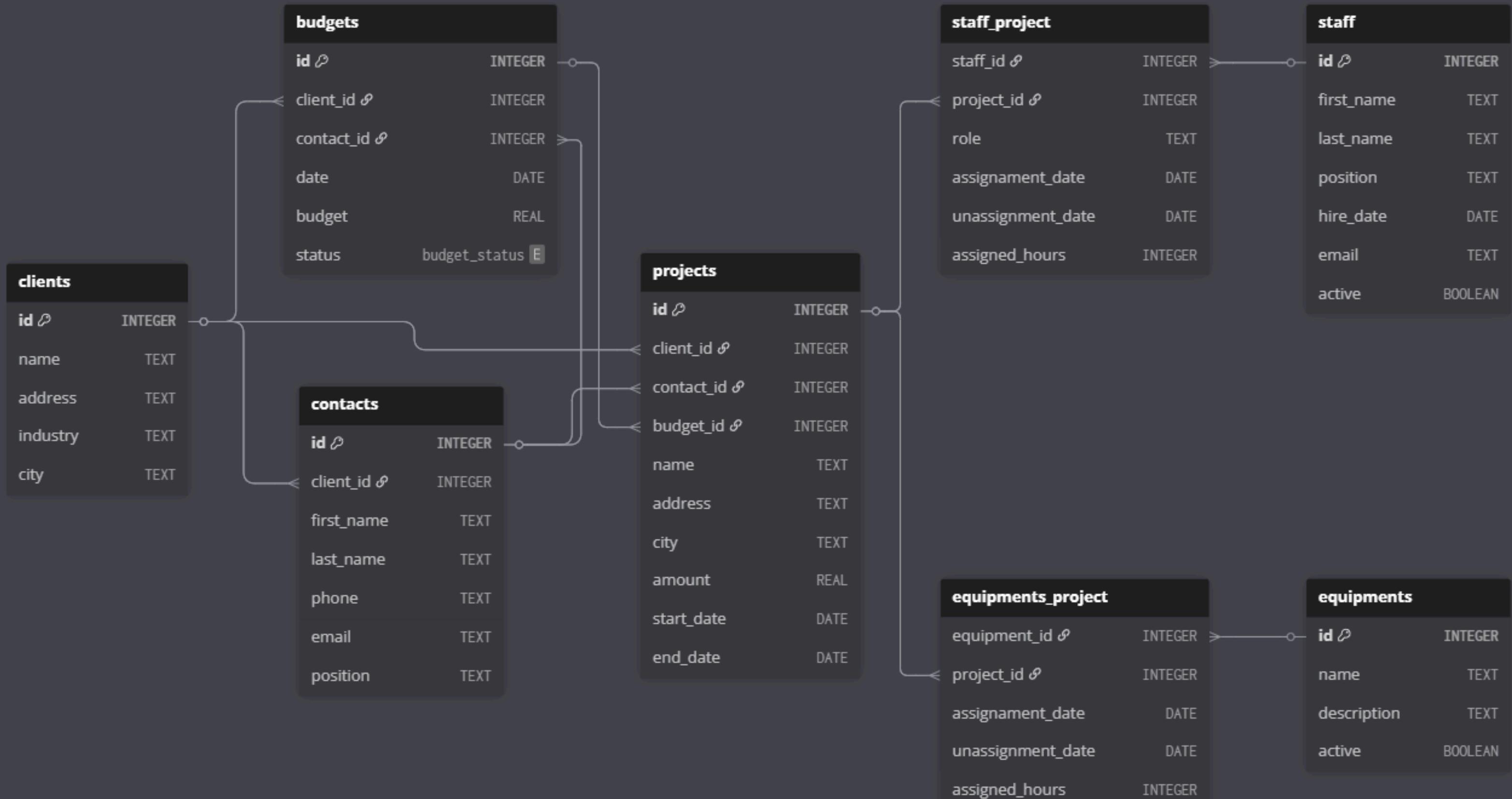
Employee payroll, benefits, or HR performance metrics.

Inventory control of equipment parts or consumables.

Client satisfaction.

Attendance or time-tracking (e.g., clock-in/clock-out).

Entity-Relationship Diagram (ERD)



Tables

| clients | |
|-------------|---------|
| <i>id</i> ↗ | INTEGER |
| name | TEXT |
| address | TEXT |
| industry | TEXT |
| city | TEXT |

| contacts | |
|--------------------|---------|
| <i>id</i> ↗ | INTEGER |
| <i>client_id</i> ↗ | INTEGER |
| first_name | TEXT |
| last_name | TEXT |
| phone | TEXT |
| email | TEXT |
| position | TEXT |

| budgets | |
|---------------------|--------------------------|
| <i>id</i> ↗ | INTEGER |
| <i>client_id</i> ↗ | INTEGER |
| <i>contact_id</i> ↗ | INTEGER |
| date | DATE |
| budget | REAL |
| status | <i>budget_status</i> ↗ E |

```
CREATE TABLE clients (
    id INTEGER PRIMARY KEY AUTOINCREMENT,
    name TEXT NOT NULL,
    address TEXT,
    industry TEXT,
    city TEXT
);
```

```
CREATE TABLE contacts (
    id INTEGER PRIMARY KEY AUTOINCREMENT,
    client_id INTEGER NOT NULL,
    first_name TEXT NOT NULL,
    last_name TEXT NOT NULL,
    phone TEXT,
    email TEXT,
    position TEXT,
    FOREIGN KEY(client_id) REFERENCES clients(id)
);
```

```
CREATE TABLE budgets (
    id INTEGER PRIMARY KEY AUTOINCREMENT,
    client_id INTEGER NOT NULL,
    contact_id INTEGER NOT NULL,
    date DATE NOT NULL,
    budget REAL NOT NULL,
    status TEXT CHECK(status IN ('pending', 'accepted', 'rejected')) NOT NULL,
    FOREIGN KEY(contact_id) REFERENCES contacts(id),
    FOREIGN KEY(client_id) REFERENCES clients(id)
);
```

Tables

projects

| | |
|---------------------|---------|
| id <i>PK</i> | INTEGER |
| client_id | INTEGER |
| contact_id | INTEGER |
| budget_id | INTEGER |
| name | TEXT |
| address | TEXT |
| city | TEXT |
| amount | REAL |
| start_date | DATE |
| end_date | DATE |

```
CREATE TABLE projects (
    id INTEGER PRIMARY KEY AUTOINCREMENT,
    client_id INTEGER NOT NULL,
    contact_id INTEGER NOT NULL,
    budget_id INTEGER NOT NULL,
    name TEXT NOT NULL,
    address TEXT,
    city TEXT,
    amount REAL,
    start_date DATE,
    end_date DATE,
    FOREIGN KEY (client_id) REFERENCES clients(id),
    FOREIGN KEY (contact_id) REFERENCES contacts(id),
    FOREIGN KEY (budget_id) REFERENCES budgets(id)
);
```

staff

| | |
|---------------------|---------|
| id <i>PK</i> | INTEGER |
| first_name | TEXT |
| last_name | TEXT |
| position | TEXT |
| hire_date | DATE |
| email | TEXT |
| active | BOOLEAN |

```
CREATE TABLE staff (
```

```
    id INTEGER PRIMARY KEY AUTOINCREMENT,
    first_name TEXT NOT NULL,
    last_name TEXT NOT NULL,
    position TEXT,
    hire_date DATE,
    email TEXT,
    active BOOLEAN DEFAULT TRUE
);
```

equipments

| | |
|---------------------|---------|
| id <i>PK</i> | INTEGER |
| name | TEXT |
| description | TEXT |
| active | BOOLEAN |

```
CREATE TABLE equipments (
```

```
    id INTEGER PRIMARY KEY AUTOINCREMENT,
    name TEXT NOT NULL,
    description TEXT NOT NULL,
    active BOOLEAN DEFAULT TRUE
);
```

Tables

staff_project

| | |
|-------------------|---------|
| staff_id | INTEGER |
| project_id | INTEGER |
| role | TEXT |
| assignment_date | DATE |
| unassignment_date | DATE |
| assigned_hours | INTEGER |

equipments_project

| | |
|-------------------|---------|
| equipment_id | INTEGER |
| project_id | INTEGER |
| assignment_date | DATE |
| unassignment_date | DATE |
| assigned_hours | INTEGER |

```
CREATE TABLE staff_project (
    staff_id INTEGER,
    project_id INTEGER,
    role TEXT,
    assignment_date DATE,
    unassignment_date DATE,
    assigned_hours INTEGER NOT NULL,
    PRIMARY KEY (staff_id, project_id),
    FOREIGN KEY (staff_id) REFERENCES staff(id),
    FOREIGN KEY (project_id) REFERENCES projects(id)
);
```

```
CREATE TABLE equipments_project (
    equipment_id INTEGER,
    project_id INTEGER,
    assignment_date DATE,
    unassignment_date DATE,
    assigned_hours INTEGER NOT NULL,
    PRIMARY KEY (equipment_id, project_id),
    FOREIGN KEY (equipment_id) REFERENCES equipments(id),
    FOREIGN KEY (project_id) REFERENCES projects(id)
);
```

Indexes

```
-- STAFF
CREATE INDEX idx_staff_last_name ON staff(last_name);
-- CLIENTS
CREATE INDEX idx_clients_name ON clients(name);
CREATE INDEX idx_clients_city ON clients(city);
-- CONTACTS
CREATE INDEX idx_contacts_client_id ON contacts(client_id);
-- BUDGETS
CREATE INDEX idx_budgets_client_id ON budgets(client_id);
CREATE INDEX idx_budgets_contact_id ON budgets(contact_id);
CREATE INDEX idx_budgets_status ON budgets(status);
-- PROJECTS
CREATE INDEX idx_projects_client_id ON projects(client_id);
CREATE INDEX idx_projects_contact_id ON projects(contact_id);
CREATE INDEX idx_projects_budget_id ON projects(budget_id);
-- STAFF PROJECT
CREATE INDEX idx_staff_project_project_id ON staff_project(project_id);
-- EQUIPMENT PROJECT
CREATE INDEX idx_equipment_project_project_id ON equipment_project(project_id);
-- EQUIPMENT
CREATE INDEX idx_equipments_name ON equipments(name);
CREATE INDEX idx_equipments_active ON equipments(active);
```

Views

```
CREATE VIEW active_staff_view AS
SELECT
    id,
    first_name,
    last_name,
    position,
    hire_date
FROM staff
WHERE active = TRUE;
```

| id | first_name | last_name | position | hire_date |
|----|------------|-----------|----------------|------------|
| 1 | Lucas | Fernandez | Engineer | 2022-03-15 |
| 2 | Sophia | Gonzalez | Engineer | 2021-07-01 |
| 3 | Matias | Romero | Engineer | 2023-01-20 |
| 4 | Camila | Vargas | Drafter | 2022-11-05 |
| 5 | Diego | Martinez | Lathe Operator | 2020-06-10 |
| 6 | Marcos | Lopez | Machinist | 2021-09-12 |
| 7 | Andres | Rojas | Welder | 2022-02-18 |
| 8 | Lucia | Herrera | Assembler | 2023-03-22 |
| 9 | Javier | Sanchez | Welder | 2021-08-30 |
| 10 | Valentina | Perez | Assembler | 2022-12-14 |

```
CREATE VIEW project_detail_view AS
SELECT
    p.id AS project_id,
    p.name AS project_name,
    c.name AS client,
    p.amount AS amount,
    p.start_date,
    p.end_date
FROM projects p
JOIN clients c ON p.client_id = c.id;
```

| project_id | project_name | client | amount | start_date | end_date |
|------------|-------------------------------|----------------------|----------|------------|------------|
| 1 | Solar Panel Installation | GreenTech Industries | 52000.0 | 2024-02-01 | 2024-06-01 |
| 2 | Wind Turbine Setup | GreenTech Industries | 70000.0 | 2024-03-01 | 2024-07-15 |
| 3 | Irrigation System Upgrade | AgroPlus Corp | 125000.0 | 2024-04-01 | 2024-08-30 |
| 4 | Greenhouse Expansion | AgroPlus Corp | 85000.0 | 2024-05-01 | 2024-09-15 |
| 5 | Factory Equipment Maintenance | MetalWorks Ltd | 62000.0 | 2024-02-15 | 2024-06-15 |
| 6 | New Production Line Setup | MetalWorks Ltd | 83000.0 | 2024-03-10 | 2024-07-20 |
| 7 | Office Building Construction | UrbanBuild Co | 115000.0 | 2025-01-01 | 2025-12-31 |
| 8 | Supply Chain Optimization | Foodies Inc | 48000.0 | 2025-08-01 | 2025-12-01 |
| 9 | Food Packaging Automation | Foodies Inc | 44000.0 | 2025-09-01 | 2025-12-01 |
| 10 | New Warehouse Setup | Foodies Inc | 53000.0 | 2025-10-01 | 2026-01-15 |

```
CREATE VIEW staff_assignment_summary_view AS
SELECT
    s.id AS staff_id,
    s.first_name || ' ' || s.last_name AS staff_name,
    COUNT(DISTINCT sp.project_id) AS total_projects,
    SUM(sp.assigned_hours) AS total_hours
FROM staff s
JOIN staff_project sp ON s.id = sp.staff_id
GROUP BY s.id;
```

| staff_id | staff_name | total_projects | total_hours |
|----------|-----------------|----------------|-------------|
| 1 | Lucas Fernandez | 4 | 365 |
| 2 | Sophia Gonzalez | 3 | 185 |
| 3 | Matias Romero | 3 | 215 |
| 5 | Diego Martinez | 5 | 275 |
| 6 | Marcos Lopez | 4 | 215 |
| 7 | Andres Rojas | 2 | 120 |
| 8 | Lucia Herrera | 3 | 125 |
| 9 | Javier Sanchez | 4 | 195 |
| 10 | Valentina Perez | 2 | 130 |

Views

```
CREATE VIEW staff_projects_view AS
SELECT
    s.id AS staff_id,
    s.first_name || ' ' || s.last_name AS staff_name,
    p.id AS project_id,
    p.name AS project_name,
    c.name AS client_name,
    sp.role,
    sp.assigned_hours
FROM staff s
JOIN staff_project sp ON s.id = sp.staff_id
JOIN projects p ON sp.project_id = p.id
JOIN clients c ON p.client_id = c.id;
```

| staff_id | staff_name | project_id | project_name | client_name | role | assigned_hours |
|----------|-----------------|------------|-------------------------------|----------------------|----------------|----------------|
| 1 | Lucas Fernandez | 1 | Solar Panel Installation | GreenTech Industries | Engineer | 100 |
| 5 | Diego Martinez | 1 | Solar Panel Installation | GreenTech Industries | Lathe Operator | 80 |
| 7 | Andres Rojas | 1 | Solar Panel Installation | GreenTech Industries | Welder | 60 |
| 2 | Sophia Gonzalez | 2 | Wind Turbine Setup | GreenTech Industries | Engineer | 90 |
| 6 | Marcos Lopez | 2 | Wind Turbine Setup | GreenTech Industries | Machinist | 70 |
| 8 | Lucia Herrera | 2 | Wind Turbine Setup | GreenTech Industries | Assembler | 60 |
| 3 | Matias Romero | 3 | Irrigation System Upgrade | AgroPlus Corp | Engineer | 110 |
| 5 | Diego Martinez | 3 | Irrigation System Upgrade | AgroPlus Corp | Lathe Operator | 75 |
| 9 | Javier Sanchez | 3 | Irrigation System Upgrade | AgroPlus Corp | Welder | 65 |
| 1 | Lucas Fernandez | 4 | Greenhouse Expansion | AgroPlus Corp | Engineer | 85 |
| 6 | Marcos Lopez | 4 | Greenhouse Expansion | AgroPlus Corp | Machinist | 70 |
| 10 | Valentina Perez | 4 | Greenhouse Expansion | AgroPlus Corp | Assembler | 60 |
| 2 | Sophia Gonzalez | 5 | Factory Equipment Maintenance | MetalWorks Ltd | Engineer | 95 |
| 5 | Diego Martinez | 5 | Factory Equipment Maintenance | MetalWorks Ltd | Lathe Operator | 70 |
| 7 | Andres Rojas | 5 | Factory Equipment Maintenance | MetalWorks Ltd | Welder | 60 |
| 3 | Matias Romero | 6 | New Production Line Setup | MetalWorks Ltd | Engineer | 105 |
| 6 | Marcos Lopez | 6 | New Production Line Setup | MetalWorks Ltd | Machinist | 75 |
| 8 | Lucia Herrera | 6 | New Production Line Setup | MetalWorks Ltd | Assembler | 65 |
| 1 | Lucas Fernandez | 7 | Office Building Construction | UrbanBuild Co | Engineer | 120 |
| 9 | Javier Sanchez | 7 | Office Building Construction | UrbanBuild Co | Welder | 80 |
| 10 | Valentina Perez | 7 | Office Building Construction | UrbanBuild Co | Assembler | 70 |
| 1 | Lucas Fernandez | 8 | Supply Chain Optimization | Foodies Inc | Engineer | 60 |
| 5 | Diego Martinez | 8 | Supply Chain Optimization | Foodies Inc | Lathe Operator | 50 |
| 9 | Javier Sanchez | 8 | Supply Chain Optimization | Foodies Inc | Welder | 50 |
| 2 | Sophia Gonzalez | 9 | Food Packaging Automation | Foodies Inc | Engineer | 0 |
| 6 | Marcos Lopez | 9 | Food Packaging Automation | Foodies Inc | Machinist | 0 |
| 8 | Lucia Herrera | 9 | Food Packaging Automation | Foodies Inc | Assembler | 0 |
| 3 | Matias Romero | 10 | New Warehouse Setup | Foodies Inc | Engineer | 0 |
| 5 | Diego Martinez | 10 | New Warehouse Setup | Foodies Inc | Lathe Operator | 0 |
| 9 | Javier Sanchez | 10 | New Warehouse Setup | Foodies Inc | Welder | 0 |

```
CREATE VIEW budget_status_view AS
SELECT
    c.name AS client,
    b.status,
    SUM(b.budget) AS total_amount
FROM budgets b
JOIN clients c ON b.client_id = c.id
GROUP BY c.name, b.status;
```

| client | status | total_amount |
|----------------------|----------|--------------|
| AgroPlus Corp | accepted | 120000.0 |
| AgroPlus Corp | rejected | 90000.0 |
| Foodies Inc | accepted | 45000.0 |
| Foodies Inc | pending | 47000.0 |
| Foodies Inc | rejected | 50000.0 |
| GreenTech Industries | accepted | 75000.0 |
| GreenTech Industries | pending | 50000.0 |
| MetalWorks Ltd | accepted | 85000.0 |
| MetalWorks Ltd | pending | 60000.0 |
| UrbanBuild Co | pending | 110000.0 |

Views

```
CREATE VIEW project_team_view AS
SELECT
    p.id AS project_id,
    p.name AS project_name,
    s.first_name || ' ' || s.last_name AS staff_name,
    sp.role,
    sp.assignment_date,
    sp.unassignment_date
FROM staff_project sp
JOIN staff s ON sp.staff_id = s.id
JOIN projects p ON sp.project_id = p.id;
```

| project_id | project_name | staff_name | role | assignment_date | unassignment_date |
|------------|-------------------------------|-----------------|----------------|-----------------|-------------------|
| 1 | Solar Panel Installation | Lucas Fernandez | Engineer | 2024-02-01 | 2024-06-01 |
| 1 | Solar Panel Installation | Diego Martinez | Lathe Operator | 2024-02-05 | 2024-05-30 |
| 1 | Solar Panel Installation | Andres Rojas | Welder | 2024-02-10 | 2024-05-25 |
| 2 | Wind Turbine Setup | Sophia Gonzalez | Engineer | 2024-03-01 | 2024-07-15 |
| 2 | Wind Turbine Setup | Marcos Lopez | Machinist | 2024-03-05 | 2024-07-10 |
| 2 | Wind Turbine Setup | Lucia Herrera | Assembler | 2024-03-10 | 2024-07-05 |
| 3 | Irrigation System Upgrade | Matias Romero | Engineer | 2024-04-01 | 2024-08-30 |
| 3 | Irrigation System Upgrade | Diego Martinez | Lathe Operator | 2024-04-05 | 2024-08-25 |
| 3 | Irrigation System Upgrade | Javier Sanchez | Welder | 2024-04-10 | 2024-08-20 |
| 4 | Greenhouse Expansion | Lucas Fernandez | Engineer | 2024-05-01 | 2024-09-15 |
| 4 | Greenhouse Expansion | Marcos Lopez | Machinist | 2024-05-05 | 2024-09-10 |
| 4 | Greenhouse Expansion | Valentina Perez | Assembler | 2024-05-10 | 2024-09-05 |
| 5 | Factory Equipment Maintenance | Sophia Gonzalez | Engineer | 2024-02-15 | 2024-06-15 |
| 5 | Factory Equipment Maintenance | Diego Martinez | Lathe Operator | 2024-02-20 | 2024-06-10 |
| 5 | Factory Equipment Maintenance | Andres Rojas | Welder | 2024-02-25 | 2024-06-05 |
| 6 | New Production Line Setup | Matias Romero | Engineer | 2024-03-10 | 2024-07-20 |
| 6 | New Production Line Setup | Marcos Lopez | Machinist | 2024-03-15 | 2024-07-15 |
| 6 | New Production Line Setup | Lucia Herrera | Assembler | 2024-03-20 | 2024-07-10 |
| 7 | Office Building Construction | Lucas Fernandez | Engineer | 2025-01-01 | 2025-12-31 |
| 7 | Office Building Construction | Javier Sanchez | Welder | 2025-01-05 | 2025-12-15 |
| 7 | Office Building Construction | Valentina Perez | Assembler | 2025-01-10 | 2025-12-01 |
| 8 | Supply Chain Optimization | Lucas Fernandez | Engineer | 2025-08-01 | 2025-12-01 |
| 8 | Supply Chain Optimization | Diego Martinez | Lathe Operator | 2025-08-05 | 2025-12-01 |
| 8 | Supply Chain Optimization | Javier Sanchez | Welder | 2025-08-10 | 2025-12-01 |
| 9 | Food Packaging Automation | Sophia Gonzalez | Engineer | 2025-09-01 | 2025-12-01 |
| 9 | Food Packaging Automation | Marcos Lopez | Machinist | 2025-09-01 | 2025-12-01 |
| 9 | Food Packaging Automation | Lucia Herrera | Assembler | 2025-09-01 | 2025-12-01 |
| 10 | New Warehouse Setup | Matias Romero | Engineer | 2025-10-01 | 2026-01-15 |
| 10 | New Warehouse Setup | Diego Martinez | Lathe Operator | 2025-10-01 | 2026-01-15 |
| 10 | New Warehouse Setup | Javier Sanchez | Welder | 2025-10-01 | 2026-01-15 |

```
CREATE VIEW active_staff_summary AS
SELECT
    s.id,
    s.first_name,
    s.last_name,
    COUNT(sp.project_id) AS project_count
FROM staff s
LEFT JOIN staff_project sp ON s.id = sp.staff_id
WHERE s.active = TRUE
GROUP BY s.id;
```

| id | first_name | last_name | project_count |
|----|------------|-----------|---------------|
| 1 | Lucas | Fernandez | 4 |
| 2 | Sophia | Gonzalez | 3 |
| 3 | Matias | Romero | 3 |
| 4 | Camila | Vargas | 0 |
| 5 | Diego | Martinez | 5 |
| 6 | Marcos | Lopez | 4 |
| 7 | Andres | Rojas | 2 |
| 8 | Lucia | Herrera | 3 |
| 9 | Javier | Sanchez | 4 |
| 10 | Valentina | Perez | 2 |

Views

```
CREATE VIEW project_overview AS
SELECT
    p.id AS project_id,
    p.name AS project_name,
    p.start_date,
    p.end_date,
    p.city,
    p.amount AS amount,
    c.name AS client_name,
    b.budget AS quoted_amount,
    b.status AS quotation_status
FROM projects p
JOIN budgets b ON p.budget_id = b.id
JOIN clients c ON p.client_id = c.id;
```

| project_id | project_name | start_date | end_date | city | amount | client_name | quoted_amount | quotation_status |
|------------|-------------------------------|------------|------------|--------------|----------|----------------------|---------------|------------------|
| 1 | Solar Panel Installation | 2024-02-01 | 2024-06-01 | Rosario | 52000.0 | GreenTech Industries | 50000.0 | pending |
| 2 | Wind Turbine Setup | 2024-03-01 | 2024-07-15 | Rosario | 70000.0 | GreenTech Industries | 75000.0 | accepted |
| 3 | Irrigation System Upgrade | 2024-04-01 | 2024-08-30 | Santa Fe | 125000.0 | AgroPlus Corp | 120000.0 | accepted |
| 4 | Greenhouse Expansion | 2024-05-01 | 2024-09-15 | Santa Fe | 85000.0 | AgroPlus Corp | 90000.0 | rejected |
| 5 | Factory Equipment Maintenance | 2024-02-15 | 2024-06-15 | Rosario | 62000.0 | MetalWorks Ltd | 60000.0 | pending |
| 6 | New Production Line Setup | 2024-03-10 | 2024-07-20 | Rosario | 83000.0 | MetalWorks Ltd | 85000.0 | accepted |
| 7 | Office Building Construction | 2025-01-01 | 2025-12-31 | Córdoba | 115000.0 | UrbanBuild Co | 110000.0 | pending |
| 8 | Supply Chain Optimization | 2025-08-01 | 2025-12-01 | Buenos Aires | 48000.0 | Foodies Inc | 47000.0 | pending |
| 9 | Food Packaging Automation | 2025-09-01 | 2025-12-01 | Buenos Aires | 44000.0 | Foodies Inc | 45000.0 | accepted |
| 10 | New Warehouse Setup | 2025-10-01 | 2026-01-15 | Buenos Aires | 53000.0 | Foodies Inc | 50000.0 | rejected |

Triggers

```
-- TRIGGER: Soft delete for staff
CREATE TRIGGER prevent_staff_delete
BEFORE DELETE ON staff
FOR EACH ROW
BEGIN
    -- Cambiar activo a FALSE
    UPDATE staff
    SET active = FALSE
    WHERE id = OLD.id;

    -- Cancelar el DELETE lanzando un error
    SELECT RAISE(ABORT, 'Soft delete applied');
END;
```

Queries

```
--PROJECT AND STATUS
```

```
SELECT p.name, p.start_date, p.end_date,
CASE
    WHEN p.end_date < DATE('now') THEN 'Completed'
    WHEN p.start_date > DATE('now') THEN 'Pending'
    ELSE 'Ongoing'
END AS status
FROM projects p;
```

```
--BUDGET DEVIATION VS ACTUAL EXPENDITURE
```

```
SELECT p.name, b.budget, p.amount,
       p.amount - b.budget AS variance
FROM projects p
JOIN budgets b ON p.budget_id = b.id;
```

| name | start_date | end_date | status |
|-------------------------------|------------|------------|-----------|
| Solar Panel Installation | 2024-02-01 | 2024-06-01 | Completed |
| Wind Turbine Setup | 2024-03-01 | 2024-07-15 | Completed |
| Irrigation System Upgrade | 2024-04-01 | 2024-08-30 | Completed |
| Greenhouse Expansion | 2024-05-01 | 2024-09-15 | Completed |
| Factory Equipment Maintenance | 2024-02-15 | 2024-06-15 | Completed |
| New Production Line Setup | 2024-03-10 | 2024-07-20 | Completed |
| Office Building Construction | 2025-01-01 | 2025-12-31 | Ongoing |
| Supply Chain Optimization | 2025-08-01 | 2025-12-01 | Ongoing |
| Food Packaging Automation | 2025-09-01 | 2025-12-01 | Pending |
| New Warehouse Setup | 2025-10-01 | 2026-01-15 | Pending |

| name | budget | amount | variance |
|-------------------------------|----------|----------|----------|
| Solar Panel Installation | 50000.0 | 52000.0 | 2000.0 |
| Wind Turbine Setup | 75000.0 | 70000.0 | -5000.0 |
| Irrigation System Upgrade | 120000.0 | 125000.0 | 5000.0 |
| Greenhouse Expansion | 90000.0 | 85000.0 | -5000.0 |
| Factory Equipment Maintenance | 60000.0 | 62000.0 | 2000.0 |
| New Production Line Setup | 85000.0 | 83000.0 | -2000.0 |
| Office Building Construction | 110000.0 | 115000.0 | 5000.0 |
| Supply Chain Optimization | 47000.0 | 48000.0 | 1000.0 |
| Food Packaging Automation | 45000.0 | 44000.0 | -1000.0 |
| New Warehouse Setup | 50000.0 | 53000.0 | 3000.0 |

Queries

```
--TOP 5 HOURS ASSIGNED BY STAFF
SELECT s.first_name || ' ' || s.last_name AS staff_name,
       SUM(sp.assigned_hours) AS total_hours
  FROM staff s
 JOIN staff_project sp ON s.id = sp.staff_id
 GROUP BY s.id
 ORDER BY total_hours DESC
 LIMIT 5;
```

| staff_name | total_hours |
|-----------------|-------------|
| Lucas Fernandez | 365 |
| Diego Martinez | 275 |
| Matias Romero | 215 |
| Marcos Lopez | 215 |
| Javier Sanchez | 195 |

```
--TEAMS ASSIGNED TO ACTIVE PROJECTS
SELECT e.name AS equipment, p.name AS project, ep.assigned_hours
  FROM equipments e
 JOIN equipments_project ep ON e.id = ep.equipment_id
 JOIN projects p ON p.id = ep.project_id
 WHERE p.end_date >= DATE('now');
```

| equipment | project | assigned_hours |
|--------------------------|------------------------------|----------------|
| Laser Measurement System | Office Building Construction | 90 |
| CNC Milling Machine | Supply Chain Optimization | 50 |
| Welding Machine | Supply Chain Optimization | 45 |
| Lathe Machine | Food Packaging Automation | 0 |
| 3D Printer | Food Packaging Automation | 0 |
| CNC Milling Machine | New Warehouse Setup | 0 |
| Laser Measurement System | New Warehouse Setup | 0 |

Queries

```
--CLIENTS WITH THE NUMBER OF PROJECTS
SELECT c.name AS client, COUNT(p.id) AS projects_count
FROM clients c
LEFT JOIN projects p ON c.id = p.client_id
GROUP BY c.id;
```

| client | projects_count |
|----------------------|----------------|
| GreenTech Industries | 2 |
| AgroPlus Corp | 2 |
| MetalWorks Ltd | 2 |
| UrbanBuild Co | 1 |
| Foodies Inc | 3 |

```
--STAFF WITH SIMULTANEOUS PROJECTS
SELECT s.first_name || ' ' || s.last_name AS staff_name,
       COUNT(sp.project_id) AS active_projects
  FROM staff s
JOIN staff_project sp ON s.id = sp.staff_id
JOIN projects p ON p.id = sp.project_id
 WHERE DATE('now') BETWEEN p.start_date AND p.end_date
 GROUP BY s.id
 HAVING active_projects > 1
 ORDER BY active_projects DESC;
```

| staff_name | active_projects |
|-----------------|-----------------|
| Javier Sanchez | 2 |
| Lucas Fernandez | 2 |

Queries

```
--OVERBUDGET
SELECT p.name AS project, b.budget AS budgeted, p.amount AS actual, (p.amount - b.budget) AS variance
FROM projects p
JOIN budgets b ON p.budget_id = b.id
WHERE p.amount > b.budget
ORDER BY variance DESC;
```

| project | budgeted | actual | variance |
|-------------------------------|----------|----------|----------|
| Irrigation System Upgrade | 120000.0 | 125000.0 | 5000.0 |
| Office Building Construction | 110000.0 | 115000.0 | 5000.0 |
| New Warehouse Setup | 50000.0 | 53000.0 | 3000.0 |
| Solar Panel Installation | 50000.0 | 52000.0 | 2000.0 |
| Factory Equipment Maintenance | 60000.0 | 62000.0 | 2000.0 |
| Supply Chain Optimization | 47000.0 | 48000.0 | 1000.0 |

**THANKS FOR WATCHING, AND
THANKS TO HARVARD**

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