

Normalization - Project Staffing – Answer (step-by-step)

borrowed from <https://www.databasejournal.com/sql/etc/article.php/1474411/Database-Normalization.htm>

Normalize the following *project staffing* overview up to and including the third normal form (3NF) and draw the belonging Entity Relationship Diagram (ERD).

Hint: in this company an employee earns the same amount of money per hour on all projects he/she is involved in.

ProjectNumber	ProjectName	EmployeeNumber	EmployeeName	RateCategory	HourlyRate
1023	Madagascar travel site	11	Vincent Radebe	A	60
1023	Madagascar travel site	12	Pauline James	B	50
1023	Madagascar travel site	16	Charles Ramoraz	C	40
1056	Online estate agency	11	Vincent Radebe	A	60
1056	Online estate agency	17	Monique Williams	B	50

0NF: Remove calculated fields and parameters

Nothing needs to be removed

ProjectNumber
ProjectName
EmployeeNumber
EmployeeName
RateCategory
HourlyRate

1NF: Determine PK and separate repeating groups

ProjectNumber *repeating group:*
ProjectName EmployeeNumber
 EmployeeName
 RateCategory
 HourlyRate

This results in two entities/tables for 1NF

PROJECT	EMPLOYEE
<u>ProjectNumber</u>	<u>ProjectNumber</u>
ProjectName	<u>EmployeeNumber</u>
	EmployeeName
	RateCategory
	HourlyRate

hint: PK of new group in most cases combination of key original group + key new group

2NF: Separate groups whose non-key columns are not functionally dependent on the entire PK

hint: groups containing only one key field are already in 2NF, so PROJECT is already in 2NF.

EmployeeName, RateCategory and HourlyRate are determined only by EmployeeNumber, not by the combination of both ProjectNumber and EmployeeNumber.

This results in 3 entities/tables for 2NF:

PROJECT
<u>ProjectNumber</u>
ProjectName

PROJECT_EMPLOYEE
<u>ProjectNumber</u>
<u>EmployeeNumber</u>

EMPLOYEE
<u>EmployeeNumber</u>
EmployeeName
RateCategory
HourlyRate

3NF: Separate groups whose non-key columns are functionally dependent on each other

hint: groups containing zero or one non-key attribute are already in 3NF, so both PROJECT and EMPLOYEE_PROJECT are already in 3NF.

HourlyRate is only dependent on non-key attribute RateCategory, so these need to be moved to a separate entity/table. This results in 4 entities for 3NF:

PROJECT
<u>ProjectNumber</u>
ProjectName

PROJECT_EMPLOYEE
<u>ProjectNumber</u>
<u>EmployeeNumber</u>

EMPLOYEE
<u>EmployeeNumber</u>
EmployeeName
RateCategory

RATE
<u>RateCategory</u>
HourlyRate

The resulting Entity Relationship Diagram (ERD)

