The first NF requires that no column can have more than one value stored in a cell. In other words, it should only store atomic values. None of the tables in *shoeshop* database holdscolumns containing multiple values.

As for the second NF it states that 1NF must be granted (as we’ve said it is) but also no non-prime attribute is dependent on the proper subset of any candidate key of table. In our tables there aren´t any redundancies nor separable values disrespecting the 2NF.

Finally, the third NF requires 2NF and that any transitive functional dependency of non-prime attribute on any super key should be removed.

Since in all of our database's tables all attribute types depend are fully functional dependent on the primary key of their table and all attribute types are atomic and single-valued and there are no transitive dependencies, all tables are in 3NF

The tables below detail the dependencies between each table’s fields, showing there are no transitive functional dependencies.

**3NF Demonstration**

|  |  |  |
| --- | --- | --- |
| Field 1 | Field 2 | Dependency |
| customer\_id (pk) | name | PK Dependency |
| customer\_id (pk) | phone\_number | PK Dependency |
| customer\_id (pk) | phone\_number\_country\_prefix | PK Dependency |
| customer\_id (pk) | email\_address | PK Dependency |
| customer\_id (pk) | home\_address | PK Dependency |
| Name | phone\_number | None |
| Name | phone\_number\_country\_prefix | None |
| Name | email\_address | None |
| Name | home\_address | None |
| phone\_number | phone\_number\_country\_prefix | None |
| phone\_number | email\_adress | None |
| phone\_number | home\_address | None |
| phone\_number\_country\_prefix | email\_address | None |
| phone\_number\_country\_prefix | home\_address | None |
| email\_address | home\_address | None |
| email\_address | name | None |

Table 1: Customer

|  |  |  |
| --- | --- | --- |
| Field 1 | Field 2 | Dependency |
| supplier\_id (pk) | name | PK Dependency |
| supplier\_id (pk) | phone\_number | PK Dependency |
| supplier \_id (pk) | email\_address | PK Dependency |
| supplier\_id (pk) | business\_address | PK Dependency |
| name | phone\_number | None |
| name | email\_address | None |
| name | business\_address | None |
| phone\_number | email\_address | None |
| phone\_number | business\_address | None |
| email\_address | business\_address | None |

Table 2: Supplier

|  |  |  |
| --- | --- | --- |
| Field 1 | Field 2 | Dependency |
| product\_id (pk) | name | PK Dependency |
| product\_id (pk) | type | PK Dependency |
| product\_id (pk) | available\_quantity | PK Dependency |
| product\_id (pk) | unit\_price | PK Dependency |
| name | type | None |
| name | available\_quantity | None |
| name | unit\_price | None |
| type | available\_quantity | None |
| type | unit\_price | None |
| available\_quantity | unit\_price | None |

Table 3: Stock

|  |  |  |
| --- | --- | --- |
| Field 1 | Field 2 | Dependency |
| supplier\_order\_id (pk) | order\_date | PK Dependency |
| supplier\_order\_id (pk) | products\_received | PK Dependency |
| supplier\_order\_id (pk) | supplier\_id | PK Dependency |
| supplier\_order\_id (pk) | invoice\_date | PK Dependency |
| supplier\_order\_id (pk) | paid | PK Dependency |
| order\_date | products\_received | None |
| order\_date | supplier\_id | None |
| order\_date | invoice\_date | None |
| order\_date | paid | None |
| products\_received | supplier\_id | None |
| products\_received | invoice\_date | None |
| products\_received | paid | None |
| supplier\_id | invoice\_date | None |
| supplier\_id | paid | None |
| invoice\_date | paid | None |

Table 4: Supplier\_Order

|  |  |  |
| --- | --- | --- |
| Field 1 | Field 2 | Dependency |
| order\_item\_id (pk) | supplier\_order\_id | PK Dependency |
| order\_item\_id (pk) | product\_id | PK Dependency |
| order\_item\_id (pk) | quantity | PK Dependency |
| supplier\_order\_id | product\_id | None |
| supplier\_order\_id | quantity | None |
| product\_id | quantity | None |

Table 5: Supplier\_Order\_Item

|  |  |  |
| --- | --- | --- |
| Field 1 | Field 2 | Dependency |
| customer\_order\_id (pk) | order\_date | PK Dependency |
| customer\_order\_id (pk) | shipping\_date | PK Dependency |
| customer\_order\_id (pk) | customer\_id | PK Dependency |
| customer\_order\_id (pk) | shipping\_adress | PK Dependency |
| customer\_order\_id (pk) | payment\_received | PK Dependency |
| customer\_order\_id (pk) | invoice\_date | PK Dependency |
| customer\_order\_id (pk) | invoice\_address | PK Dependency |
| customer\_order\_id (pk) | tax\_percent\_rate | PK Dependency |
| order\_date | shipping\_date | None |
| order\_date | customer\_id | None |
| order\_date | shipping\_adress | None |
| order\_date | payment\_received | None |
| order\_date | invoice\_date | None |
| order\_date | invoice\_address | None |
| order\_date | tax\_percent\_rate | None |
| shipping\_date | customer\_id | None |
| shipping\_date | shipping\_adress | None |
| shipping\_date | payment\_received | None |
| shipping\_date | invoice\_date | None |
| shipping\_date | invoice\_address | None |
| shipping\_date | tax\_percent\_rate | None |
| customer\_id | shipping\_adress | None |
| customer\_id | payment\_received | None |
| customer\_id | invoice\_date | None |
| customer\_id | invoice\_address | None |
| customer\_id | tax\_percent\_rate | None |
| shipping\_adress | payment\_received | None |
| shipping\_adress | invoice\_date | None |
| shipping\_adress | invoice\_address | None |
| shipping\_adress | tax\_percent\_rate | None |
| payment\_received | invoice\_date | None |
| payment\_received | invoice\_address | None |
| payment\_received | tax\_percent\_rate | None |
| invoice\_date | invoice\_address | None |
| invoice\_date | tax\_percent\_rate | None |
| invoice\_address | tax\_percent\_rate | None |

Table 6: Customer\_Order

|  |  |  |
| --- | --- | --- |
| Field 1 | Field 2 | Dependency |
| order\_item\_id (pk) | customer\_order\_id | PK Dependency |
| order\_item\_id (pk) | product\_id | PK Dependency |
| order\_item\_id (pk) | quantity | PK Dependency |
| order\_item\_id (pk) | discount\_percent | PK Dependency |
| customer\_order\_id | product\_id | None |
| customer\_order\_id | quantity | None |
| customer\_order\_id | discount\_percent | None |
| product\_id | quantity | None |
| product\_id | discount\_percent | None |
| quantity | discount\_percent | None |

Table 7: Customer\_Order\_Item

|  |  |  |
| --- | --- | --- |
| Field 1 | Field 2 | Dependency |
| log\_id (pk) | product\_id | PK Dependency |
| log\_id (pk) | old\_unit\_price | PK Dependency |
| log\_id (pk) | new\_unit\_price | PK Dependency |
| log\_id (pk) | update\_date | PK Dependency |
| product\_id | old\_unit\_price | None |
| product\_id | new\_unit\_price | None |
| product\_id | update\_date | None |
| old\_unit\_price | new\_unit\_price | None |
| old\_unit\_price | update\_date | None |
| new\_unit\_price | update\_date | None |

Table 8: Log\_Price