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DEPARTMENT OF SOFTWARE ENGINEERING

Maidel Information System

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1. Project Proposal

1.1. Introduction to Maidel

Maidel is a construction company in Ankara, TR. Maidel was formed as a partnership in 1990 by three construction executives, Math Adams, Isaac Darwin and Elon Lawrance (the name is a combination of their initials). Math and Isaac had previously worked for one of the TR's largest and most successful construction companies in İstanbul, but felt frustrated at the lack of control they had over the direction of the constructions they worked on. As a result, they moved to the capital city of the TR and set up their own business in 1989. Shortly afterwards they were joined by Elon Lawrance, with whom they had worked on a project in New York, and Maidel was formed. In 1995, the three partners formed a TR limited company and between them own all the shares in it. Math Adams is Managing Director, Isaac Darwin is Finance Director and Elon Lawrance is Construction Director. They now employ about 100 staff at their office in Ankara (see Fig. 1.1).

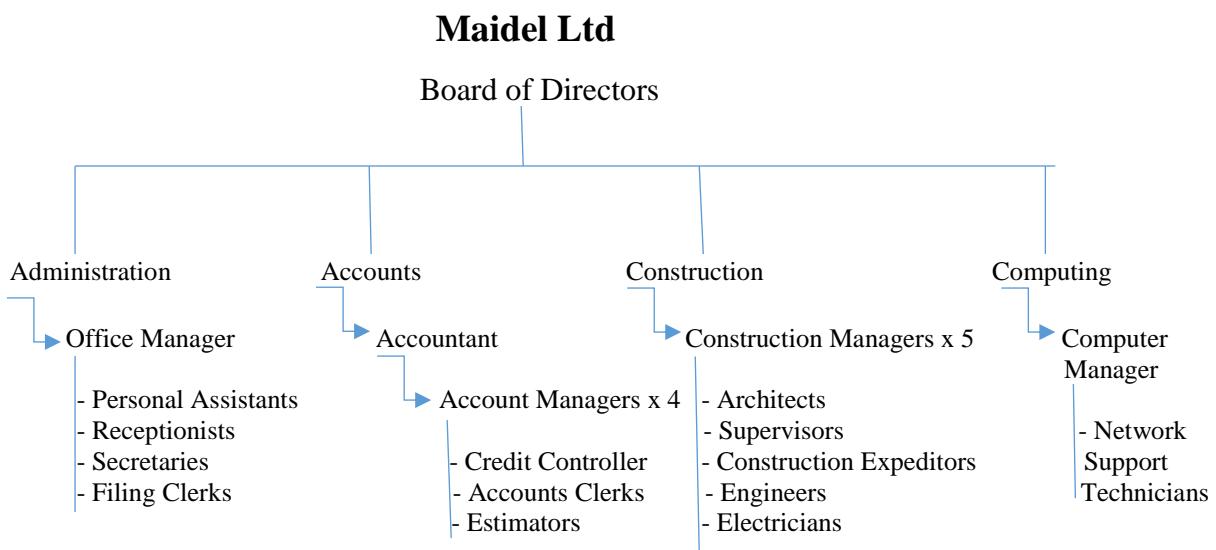


Figure 1.1.1 Staff at Maidel Ltd office

The company's objective is to grow slowly and steadily in order to become a global construction enterprise. The board of directors would like to work with more large global corporations. They believe that they can provide a high level of service in the construction of buildings with a global theme but are tailored to the needs of various organizations throughout the world. The information systems strategy of the corporation is focused on establishing systems that can support this international operation.

1.2. Existing Computer Systems

Maidel already involves full use of computers. Like most companies in the world of design, construction, and creativity, Maidel uses Apple Macintosh computers for its engineers. Apple Macs are also used by the secretaries and personal assistants. However, the corporation also uses PCs to operate Microsoft Windows-based accounting software. Despite all this, Maidel has been delayed to implement computer systems that assist other business activities including customer tracking and construction management. Last year, Maidel had a basic business system for the office developed in C++ for Windows. However, after the system was developed, the directors of Maidel decided that there should be a system developed in Java. One of the reasons for the choice of Java was that Java has a high level of portability and the company wants software that could run both on the PCs and on the Macs. Unfortunately, the person who developed the C++ software for the company (and was going to rewrite it in Java) died. Fortunately, this developer, Agnes Cohen, was methodical in her work and some object-oriented system documentation was left behind for the system she designed and developed.

This existing system has a limited scope: it primarily addresses Maidel's fundamental business information needs. It was planned to be expanded to cover the majority of Maidel's activities and to address the company's international operations.

1.3. Business Activities in the Current System

Maidel deals with other companies that it calls clients. A record is kept of each client company, and each client company has one person who is the main contact person within that company. His or her name and contact details are kept in the client record. Similarly, Maidel nominates a member of staff—a director, a construction manager or a member of the construction team—to be the contact for each client.

Clients have construction requests or plans, and a record is kept of every construction. One member of Maidel's staff, again either a director or a construction manager, manages each construction. Other staff may work on a construction and Maidel operates a project-based management structure, which means that staff may be working on more than one project at a time. For each project they work on, they are answerable to the manager of that project, who may or may not be their own line manager.

When a construction starts, the estimator responsible estimates the likely cost, materials, and labor needed to complete the construction, and declare this information to the system. Then, the manager responsible agrees with the client based on the information in the

system. A finish date may be set for a construction at any time, and may be changed. When the construction is completed, an actual completion date and the actual cost are recorded.

When the client pays, the payment date is recorded. Each construction includes one or more buildings. Buildings can be one of several types:

- External Thermal Insulation Composite Systems (ETICS) →

Exterior Wall (ETICS), Roof (Concrete), Ceiling (Concrete), Interior Wall (Lime-sand stone)

- Brick →

Exterior Wall (Insulated Brick), Roof (Concrete), Ceiling (Concrete), Interior Wall (Brick)

- Concrete →

Exterior Wall (Concrete), Roof (Concrete), Ceiling (Concrete), Interior Wall (Concrete)

- Wood →

Exterior Wall (Wood frame), Roof (Wood beams), Ceiling (Wood beams), Interior Wall (Wood Frame)

- Ventilated facade →

Exterior Wall (Ventilated facade), Roof (Concrete), Ceiling (Concrete), Interior Wall (Lime-sand stone)

- Double shell masonry →

Exterior Wall (Double shell masonry), Roof (Wood beams), Ceiling (Concrete), Interior Wall (Wood Frame)

The architect is responsible for seeing the client's needs and developing a creative solution. They develop the creative plans, communicate the plans to other construction members, and oversee their execution.

The construction expeditors manage the flow of materials from supplier to project. They must be able to determine what materials and equipment will be needed in any given project, order those materials, and manage timely delivery. The actual cost of a construction is calculated from a range of information. This includes:

- Cost of office staff (monthly salary)
- Labor costs for field employees (per hour)
- Cost of materials
- Maidel's margin on services and products bought in.

The overall estimated cost and the final actual cost of a construction are kept on the new computer system, although this information is kept in a paper-based filing system.

The new system also stores staff salary grades and field employee pay rates, allowing the cost of field employees on projects to be calculated using the timesheets, they fill out. This feature has only been partially implemented and is not currently used in the system.

1.4. Summary of Requirements

This section covers the new system's requirements.

1. To record details of Maidel's clients, suppliers and the constructing plans for those clients.

1.1 To record names, address and contact details for each client.

1.2 To record the details of each construction for each client. This will include the title of the construction, planned start and finish dates, estimated costs, materials, budgets, actual costs and dates, and the current state of completion.

1.3 To provide information that can be used in the separate accounts system for invoicing clients for constructions.

1.4 To record payments for constructions that are also recorded in the separate accounts system.

1.5 To record which staff and field employees are working on which constructions, including the construction manager for each construction.

1.6 To record which staff are assigned as staff contacts to clients.

1.7 To check on the status of constructions and whether they are within budget.

1.8 To record names, address and contact details for each supplier.

1.9 To maintain details of suppliers.

1.10 To record which suppliers are supplying for which constructions.

2. To provide construction staff with a means for recording details of buildings and the products of the construction process that leads to the development of concepts for constructions and buildings.

2.1 To allow construction staff to record notes of ideas for constructions and buildings.

2.2 To allow construction expeditors to record their notes of the flow of materials from supplier to project.

2.3 To provide other staff with access to construction project notes.

2.4 To record details of buildings, including the progress on their construction.

2.5 To schedule the dates when buildings will be constructed.

3. To record details of all staff in the company and all employees in the fields.

- 3.1** To maintain staff and field employee records for construction and administrative staff.
- 3.2** To maintain details of staff grades and the pay for those grades.
- 3.3** To record which staff are on which grade.
- 3.4** To calculate the annual bonus for all staff.
- 3.5** To maintain details of pay rates of field employees.
- 3.6** To calculate the wages of field employees.

4. Non-functional requirements.

- 4.1** To enable data about clients, constructions, buildings, staff, and field employees to be shared between offices.
- 4.2** To allow the system to be modified to work in different languages.

2. Requirements Model

2.1. Requirements List

<u>No.</u>	<u>Requirement</u>	<u>Use Case</u>
1	To record names, address and contact details for each client.	Add a new client
2	To record the details of each construction for each client. This will include the title of the construction, planned start and finish dates, estimated costs, materials, budgets, actual costs and dates, and the current state of completion.	Add a new construction
3	To provide information that can be used in the separate accounts system for invoicing clients for constructions.	Record completion of a construction
4	To record payments for constructions that are also recorded in the separate accounts system.	Record client payment
5	To record which staff and field employees are working on which constructions, including the construction manager for each construction.	Assign workers to work on a construction
6	To record which staff are assigned as staff contacts to clients.	Assign a staff contact
7	To check on the status of constructions and whether they are within budget.	Check construction budget
8	To allow construction staff to record notes of ideas for constructions and buildings.	Create note for a building or construction
9	To allow construction expeditors to record their notes of the flow of materials from supplier to project.	Create transportation note
10	To provide other staff with access to construction project notes.	Browse notes of a construction project
11	To record details of buildings, including the progress on their construction.	Record completion of a building
12	To schedule the dates when buildings will be constructed.	Add a new building to a construction
13	To maintain staff and field employee records for construction and administrative staff.	Add a new member of workers
14	To maintain details of staff grades and the pay for those grades.	Change the rate for a staff grade
15	To record which staff are on which grade.	Change the grade for a staff
16	To calculate the annual bonus for all staff.	Calculate staff bonuses
17	To maintain details of pay rates of field employees.	Change the pay rate for a field employee
18	To calculate the wages of field employees.	Calculate wages of field employees
19	To record names, address and contact details for each supplier.	Add a new supplier
20	To maintain details of suppliers.	Change information of a supplier
21	To record which suppliers are supplying for which constructions	Assign suppliers to supply for a construction
22	To enable data about clients, constructions, buildings, staff, and field employees to be shared between offices.	Not applicable
23	To allow the system to be modified to work in different languages.	Not applicable

Table 2.1.1 Requirements List

2.2. Actors and Use Cases

<u>Actor</u>	<u>Description</u>
Accountant	The accountant works in the Accounts department and is responsible for the major resourcing issues for constructions including staffing and related financial matters.
Construction Manager	Either a Director or a Construction Manager (job titles), who is responsible for assigning staff to the team and supervising their work, managing the progress of the construction, conducting any further budget negotiations and authorizing the final invoices.
Staff Contact	Member of staff who is the contact for a particular client. They provide a first point of contact for the client when the client wants to contact Maidel.
Staff	Any member of staff in Maidel.
Construction Staff	Staff with a creative role in the company, such as engineers, architects and supervisors; those who are engaged in the work of the company to manage constructions and design buildings.
Construction Expeditor	A construction staff who manages the flow of materials from supplier to project. They must be able to determine what materials and equipment will be needed in any given project, order those materials, and manage timely delivery.

Table 2.2.1 Actors descriptions

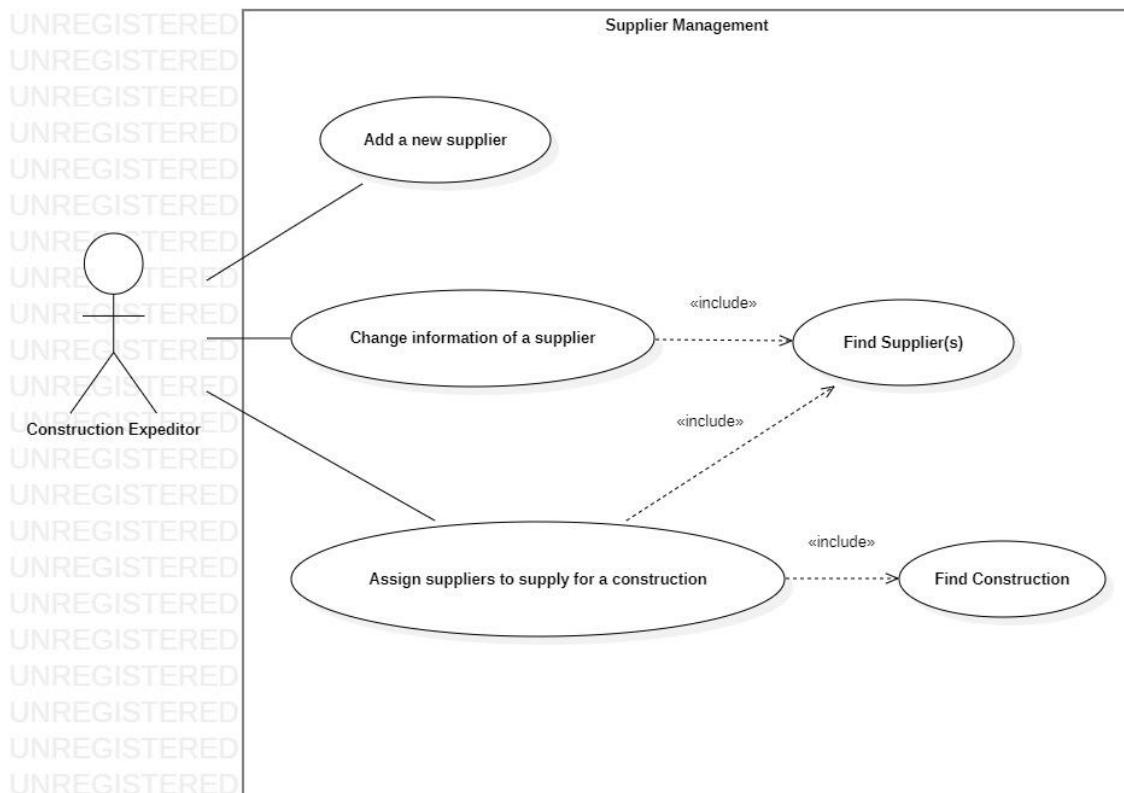


Figure 2.2.1: Use Case Diagram of Supplier Management

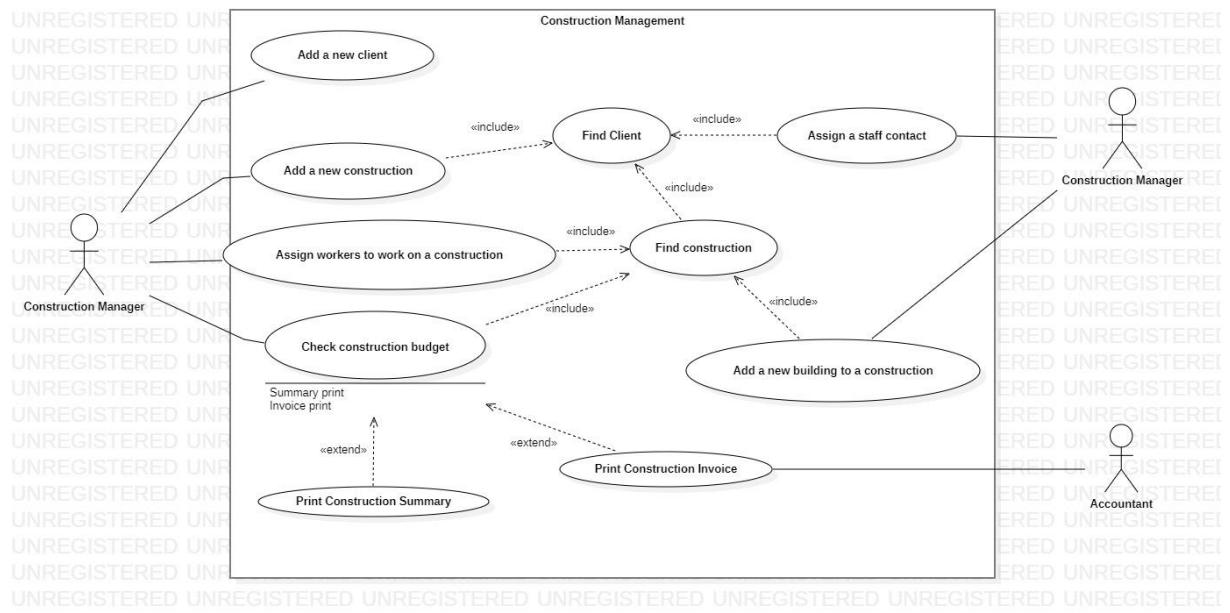


Figure 2.2.2: Use Case Diagram of Construction Management

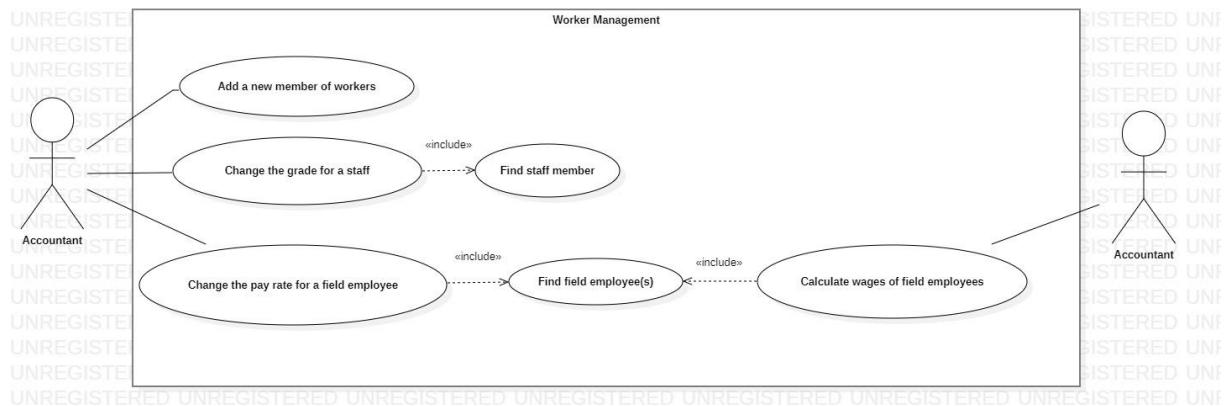


Figure 2.2.3: Use Case Diagram of Worker Management

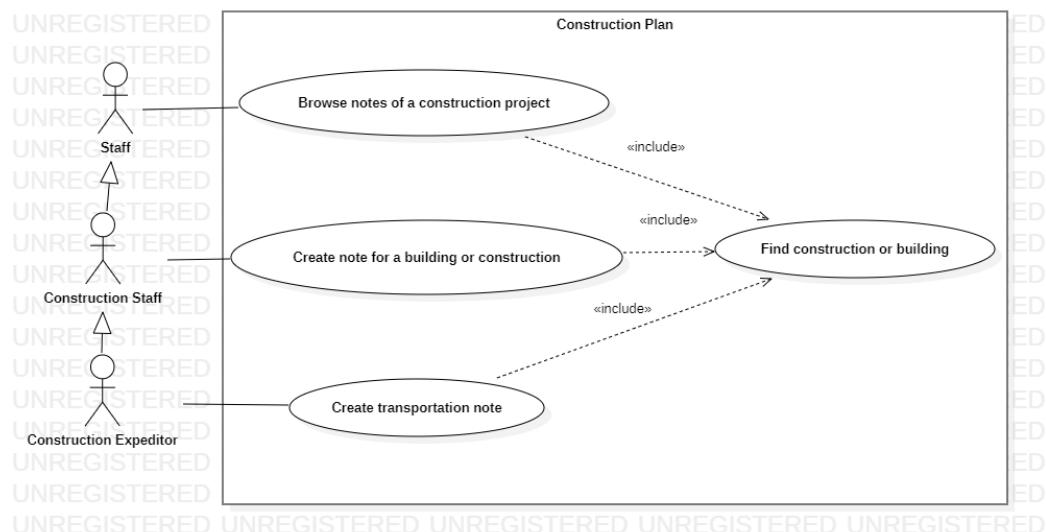


Figure 2.2.4: Use Case Diagram of Construction Plan

<u>Use Case</u>	<u>Description</u>
Add a new member of workers	When a new member of staff joins Maidel, his or her details are recorded. He or she is assigned a staff member or a field employee, and the start date is entered. Start date defaults to today's date.
Change the grade for a staff	Annually the rates for grades are changed. The new rate for each grade is entered, and the rate start date set (no default). The old grade rate is retrieved and the rate finish date for that grade rate set to the day before the start of the new rate.
Change the pay rate for a field employee	The wages of field employees are calculated according to their pay rate per hour. The new pay rate for a field employee is entered and the old pay rate is deleted.
Add a new client	When Maidel obtains a new client, the full details of the client are entered.
Add a new construction	When Maidel gets the business for a new construction, details of the construction are entered, including the intended finish date and the estimated cost. The manager for that construction is the person who enters it.
Assign workers to work on a construction	The construction manager selects a particular construction. A list of staff and field employees not already working on that construction is displayed, and he or she selects those to be assigned to this construction.
Check construction budget	The construction budget may be checked to ensure that it has not been exceeded. The current construction cost is determined by the total cost of all the buildings and the construction overheads.
Browse notes of a construction project	Any member of staff may view construction project notes for a construction. The construction must be selected first. The titles of all notes associated with that construction will be displayed. The user will be able to select a note and view the text on screen. Having viewed one note, others can be selected and viewed.
Create note for a building or construction	A member of staff working on a construction can create a note for the construction and buildings in it. The note is in text form. Each note has a title. The person who created the note, the date and time are also recorded.
Create transportation note	A construction expeditor can create a transportation note that documents the materials and equipment required for the construction, as well as the flow of these materials from the supplier to the job site. Each note has a title. The person who created the note, the date and time are also recorded.
Add a new supplier	When Maidel have a contract with a supplier for construction's materials, details of the supplier are entered. The construction expeditor is the person who enters it.
Change information of a supplier	The new information for a supplier is entered and the old information is deleted.
Assign suppliers to supply for a construction	The construction manager selects a particular construction. A list of suppliers not already supplying for that construction is displayed, and he or she selects those to be assigned to this construction.
Assign a staff contact	The construction manager selects a client. A list of staff contact members is displayed, and he or she selects one to be assigned to this client.
Calculate wages of field employees	After a list of field employees is displayed, the accountant selects field employees. After that, the accountant respectively enters how many hours the field employees worked on constructions and the system calculates and displays the wages of the selected field employees.

Table 2.2.2 Actors descriptions

Use case description: Add a new member of workers

<u>Actor Action</u>	<u>System Response</u>
1. Enters the information of new worker. Selects the type of worker. Clicks 'Add' button	2. Presents a message confirming that the new worker has been added
Alternative Courses. None.	

Table 2.2.3 User action-System Response table for Add a new member of workers

Use case description: Change the grade for a staff

<u>Actor Action</u>	<u>System Response</u>
1. None	2. Lists the names of all staff members
3. The actor selects the staff member name	4. Displays the current grade of the staff member
5. Enters the new grade for the staff member. Clicks 'Save' button	6. Changes the grade of the staff member. Presents a message confirming that the grade has been changed
Alternative Courses. None.	

Table 2.2.4 User action-System Response table for Change the grade for a staff

Use case description: Change the pay rate for a field employee

<u>Actor Action</u>	<u>System Response</u>
1. None	2. Lists the names of all field employees
3. The actor selects the field employee name	4. Displays the current pay rate of the field employee
5. Enters the new pay rate for the field employee. Clicks 'Save' button	6. Changes the pay rate of the field employee. Presents a message confirming that the pay rate has been changed
Alternative Courses. None.	

Table 2.2.5 User action-System Response table for Change the pay rate for a field employee

Use case description: Add a new client

<u>Actor Action</u>	<u>System Response</u>
1. Enters the information of new client. Clicks 'Add' button	2. Creates a new client. Presents a message confirming that the client has been added.
Alternative Courses. None.	

Table 2.2.6 User action-System Response table for Add a new client

Use case description: Add a new construction

<u>Actor Action</u>	<u>System Response</u>
1. None	2. Displays list of client names
3. The actor selects the client name	4. Lists the titles of all constructions for that client. Asks for the details of a new construction.
5. Enters all information of the new construction.	6. Creates a new construction. Presents a message confirming that the client's construction has been added with respect to the client
Alternative Courses. None.	

Table 2.2.7 User action-System Response table for Add a new construction

Use case description: Assign workers to work on a construction

<u>Actor Action</u>	<u>System Response</u>
1. None	2. Displays list of client names
3. The actor selects the client name	4. Lists the titles of all constructions for that client
5. Selects the relevant construction	6. Displays a list of all staff members and field employees not already allocated to this construction
7. Highlights the workers to be assigned to this construction. Clicks 'Allocate' button.	8. Presents a message confirming that workers have been allocated
Alternative Courses. None.	

Table 2.2.8 User action-System Response table for Assign workers to work on construction

Use case description: Check construction budget

<u>Actor Action</u>	<u>System Response</u>
1. None	2. Lists the names of all clients
3. The actor selects the client name	4. Lists the titles of all constructions for that client
5. Selects the relevant construction. Requests budget check	6. Displays the budget surplus for that construction
Extensions After step 6, the construction manager prints a construction summary. After step 6, the accountant prints a construction invoice.	

Table 2.2.9 User action-System Response table for Check construction budget

Use case description: Browse notes of a construction project

<u>Actor Action</u>	<u>System Response</u>
1. None	2. Lists the names of all clients
3. The actor selects the client name	4. Lists the titles of all constructions for that client
5. Selects the relevant construction. Requests construction project notes	6. Displays the titles of all notes for that construction project
7. Selects a note.	8. Displays all details of the note.
Alternative Courses. None.	

Table 2.2.10 User action-System Response table for Browse notes of a construction Project

Use case description: Add a new building to a construction

<u>Actor Action</u>	<u>System Response</u>
1. None	2. Lists the names of all clients
3. The actor selects the client name	4. Lists the titles of all constructions for that client
5. Selects the relevant construction.	6. List the title of all buildings
7. Enters all information of the new building. Clicks 'Add' button.	7. Presents a message confirming that the building has been added with respect to the construction.
Alternative Courses. None.	

Table 2.2.11 User action-System Response table for Add a new building to a construction

Use case description: Create transportation note

<u>Actor Action</u>	<u>System Response</u>
1. None	2. Lists the names of all clients
3. The actor selects the client name	4. Lists the titles of all constructions for that client
5. Selects the relevant construction.	6. Displays all details of the construction
8. Enters all details of the note for that construction. Clicks 'Create' button	8. Creates the note for the construction. Presents a message confirming that the note has been created.
Alternative Courses. None.	

Table 2.2.12 User action-System Response table for Create Transportation Note

Use case description: Add a new supplier

<u>Actor Action</u>	<u>System Response</u>
1. Enters the information of new supplier. Clicks 'Add' button	2. Creates a new supplier. Presents a message confirming that the supplier is added.
Alternative Courses. None.	

Table 2.2.13 User action-System Response table for Add a new supplier

Use case description: Change information of a supplier

<u>Actor Action</u>	<u>System Response</u>
1. None	2. Lists the names of all suppliers
3. Selects the relevant supplier	4. Displays all information of the supplier
5. Enters the new information for the supplier. Clicks 'Save' button.	5. Presents a message confirming that the supplier information is changed.
Alternative Courses. None.	

Table 2.2.14 User action-System Response table for Change information of a supplier

Use case description: Assign suppliers to supply for a construction

<u>Actor Action</u>	<u>System Response</u>
1. None	2. Displays list of client names
3. The actor selects the client name	4. Lists the titles of all constructions for that client
5. Selects the relevant construction	6. Displays a list of all suppliers not already allocated to this construction
7. Highlights the suppliers to be assigned to this construction. Clicks 'Allocate' button.	8. Presents a message confirming that suppliers have been allocated
Alternative Courses. None.	

Table 2.2.15 User action-System Response table for Assign suppliers to supply for a construction

Use case description: Assign staff contact

<u>Actor Action</u>	<u>System Response</u>
1. None	2. Displays list of client names
3. The actor selects the client name	4. Lists the names of all staff contact members
5. Selects a staff contact member to assign. Clicks 'Allocate' button	6. Presents a message confirming that staff contact member has been allocated
Alternative Courses. None.	

Table 2.2.16 User action-System Response table for Assign staff contact

Use case description: Calculate the wage of a field employee

<u>Actor Action</u>	<u>System Response</u>
1. None	2. Lists the names of all field employees
3. Highlights the field employees to calculate their wages.	4. Displays a field next to each names of the field employees.
5. Enters respectively for each field employees how many hours they worked on constructions.	6. Displays the wages of the field employees next to their names.
Alternative Courses. None.	

Table 2.2.17 User action-System Response table for Calculate the wage of a field employee

2.3. Glossary

<u>Term</u>	<u>Description</u>
Admin Staff	Staff within Maidel whose role is to provide administrative support that enables the work of the construction staff to take place, for example secretaries, filing clerks and the office manager.
Building	A building designed by Maidel as part of a construction. Buildings can be several types such as brick, concrete, wood, ventilated facade.
Client	A customer of Maidel. A company or organization that wishes to obtain the services of Maidel to construct and manage a construction for them
Construction	Buildings are organized into constructions in order to manage constructions more easily.
Construction Staff	Staff with a creative role in the company, such as engineers, architects and supervisors; those who are engaged in the work of the company to manage constructions and design buildings.
Construction Plan Note	A textual note about an idea for a construction or building. This is where construction staff record their ideas during the process of constructing buildings and constructors.
Filed employee	A blue-collar worker who works at the construction fields.
Grade	A job grade. Each member of staff is on a particular grade, for example ‘Architect 2’ or ‘Engineer 3’
Maidel	A construction company based in Ankara, TR.
Particular Construction Staff	Member of construction staff working on a particular construction.
Pay rate	The wages of filed employees are calculated according to their pay rate per hour.
Staff	Any member of staff in Maidel. Synonyms: Staff member, member of staff
Transportation Note	The notes that is written by a construction expeditor to record materials and equipment required for the construction, as well as the flow of these materials from the supplier to the job site.
Wage	The amount of payment for a field employee that is calculated according to the relevant pay rate.

Table 2.3.1 Glossary

2.4. Initial Architecture

The initial architecture of the system is based on the packages into which the use cases are grouped. These use cases have been grouped into four subsystem packages: Construction Management, Worker Management, Supplier Management and Construction Plan.

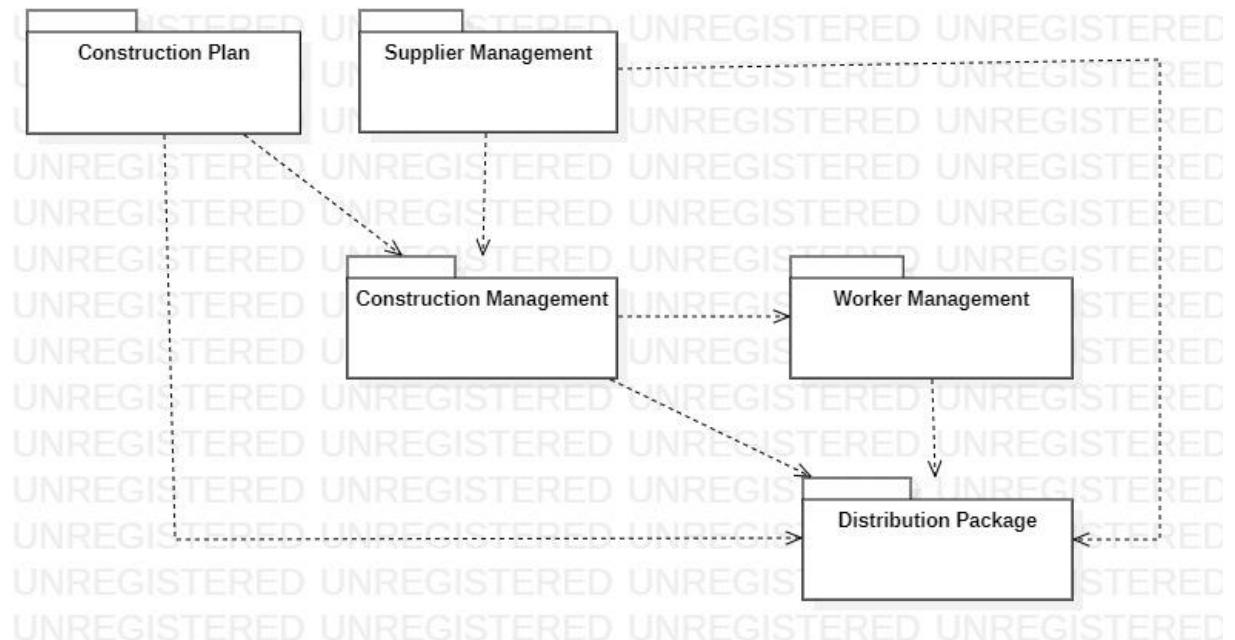


Figure 2.4.1: Initial system architecture

3. Requirements Analysis

3.1- Collaboration, Communication and Use Case Class Diagrams

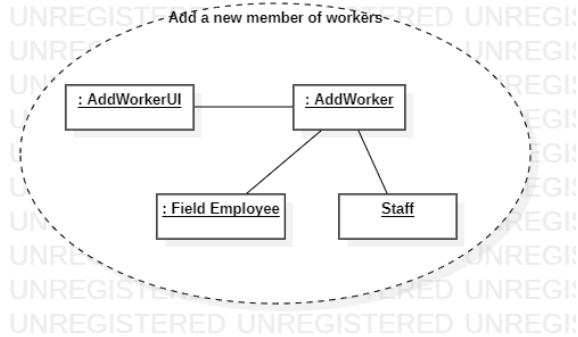


Figure 3.1.1: Collaboration diagram of Add a new member of workers

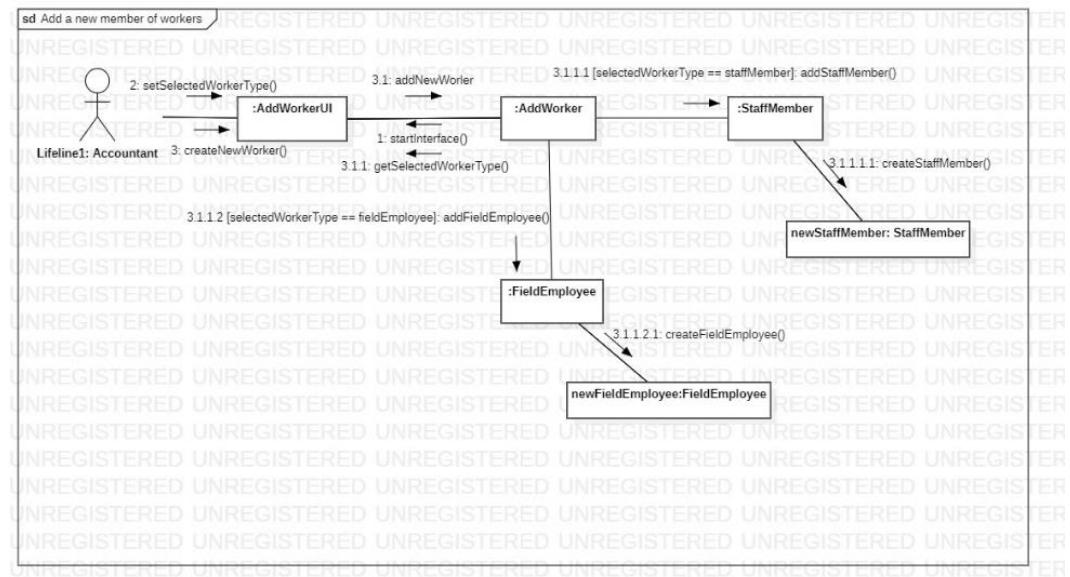


Figure 3.1.2: Communication diagram of Add a new member of workers

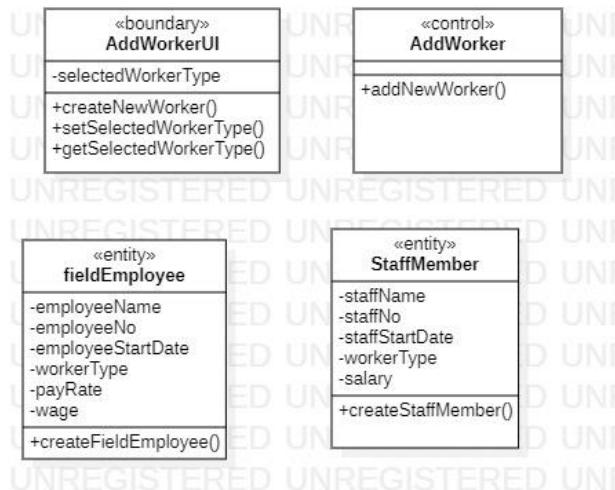


Figure 3.1.3: Use case class diagram of Add a new member of worker

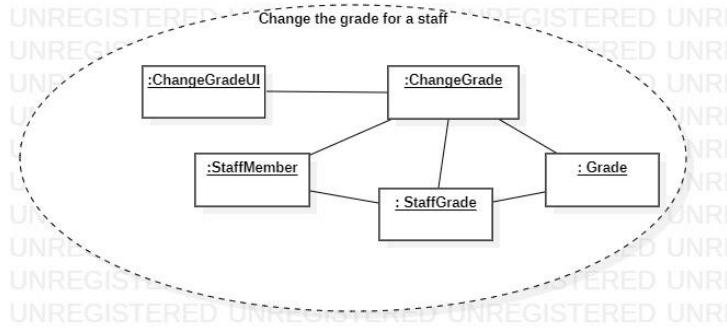


Figure 3.1.4: Collaboration diagram of Change the grade for a staff.

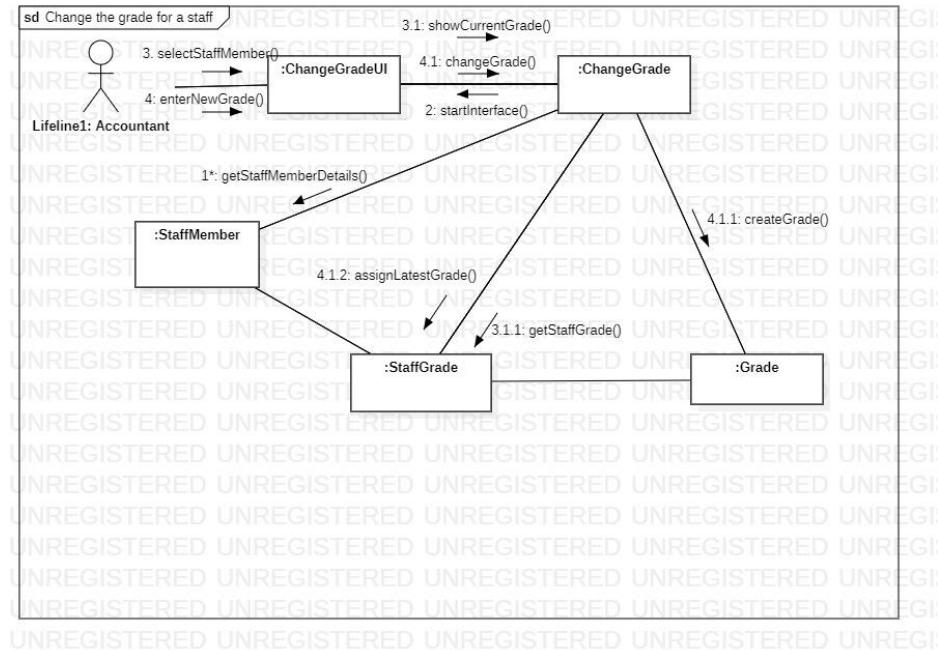


Figure 3.1.5: Communication diagram of Change the grade for a staff

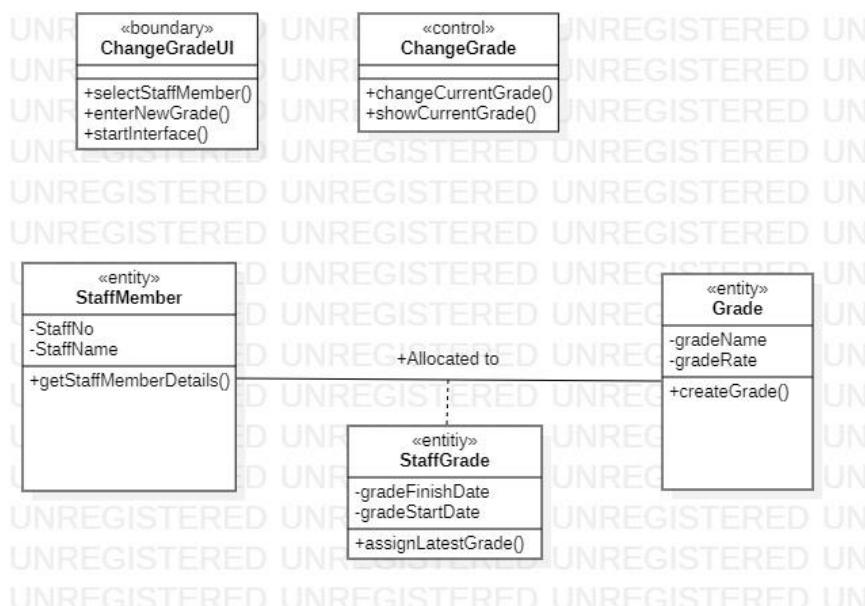


Figure 3.1.6: Use case class diagram of Change the grade for a staff

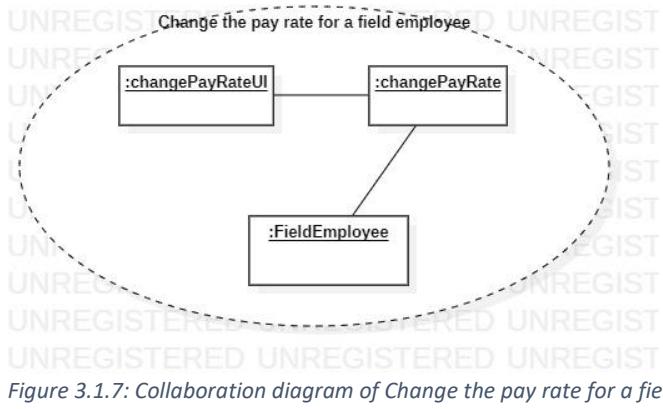


Figure 3.1.7: Collaboration diagram of Change the pay rate for a field employee

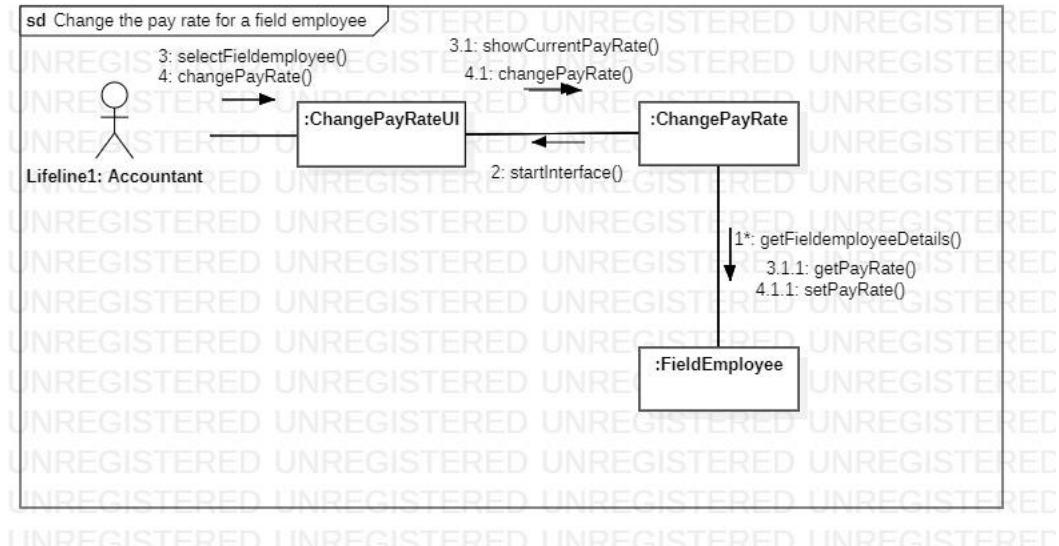


Figure 3.1.8: Communication diagram of Change the pay rate for a field employee

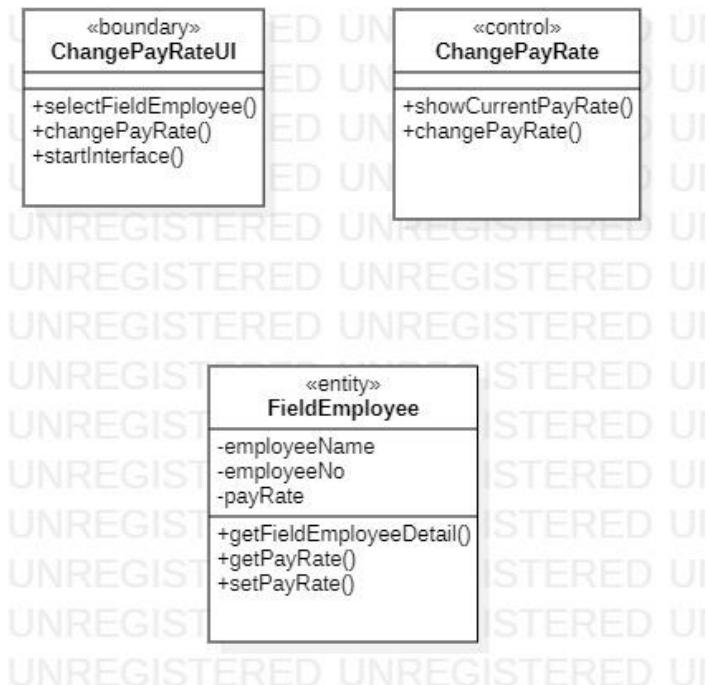


Figure 3.1.9: Use case class diagram of Change the pay rate for a field employee

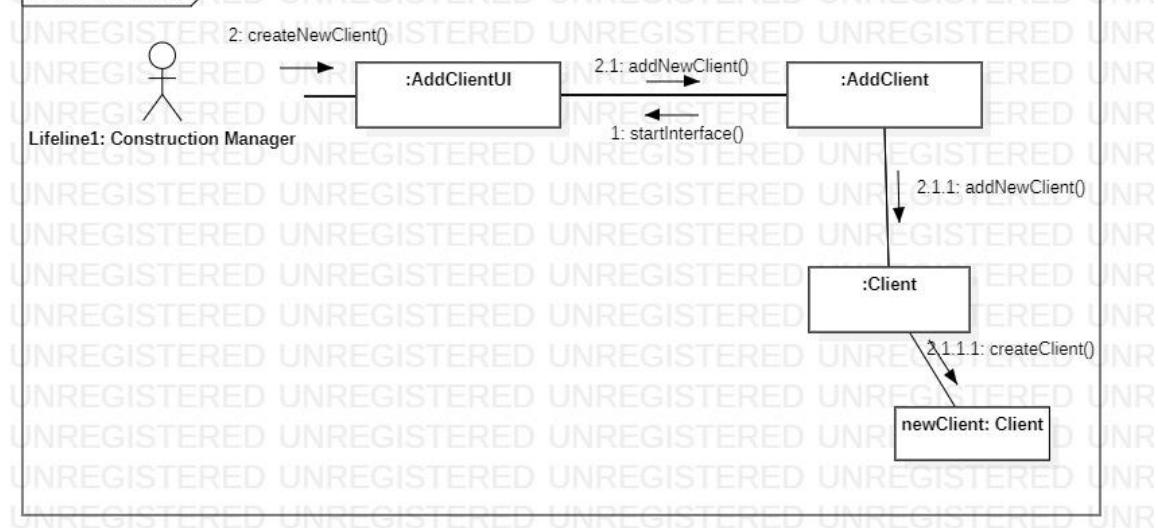
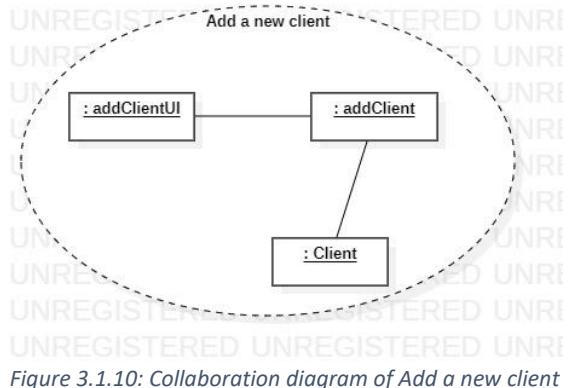


Figure 3.1.11: Communication diagram of Add a new client

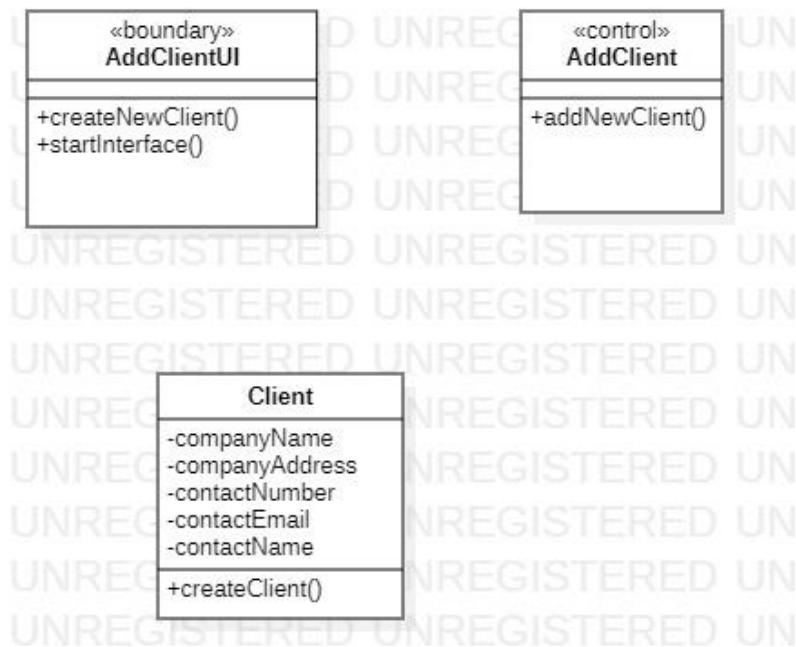


Figure 3.1.12: Use case class diagram of Add a new client

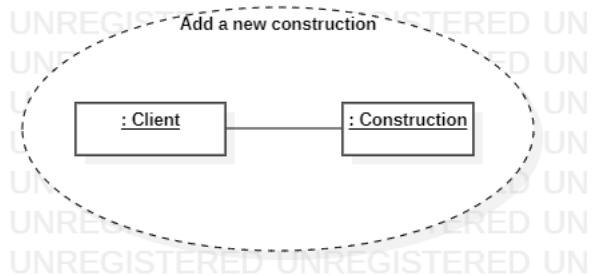


Figure 3.1.13: Collaboration diagram of Add a new construction

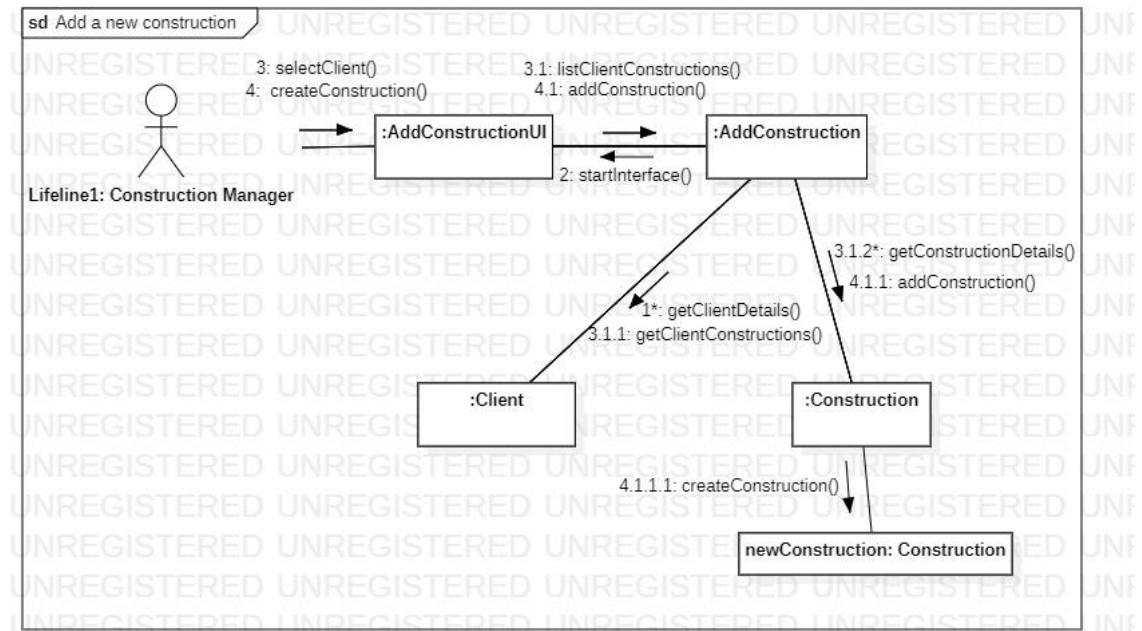


Figure 3.1.14: Communication diagram of Add a new construction

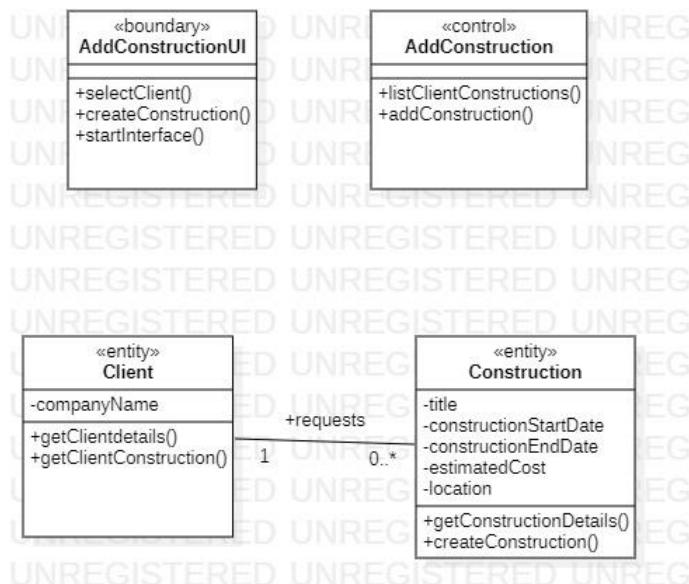


Figure 3.1.15: Use case class diagram of Add a new construction

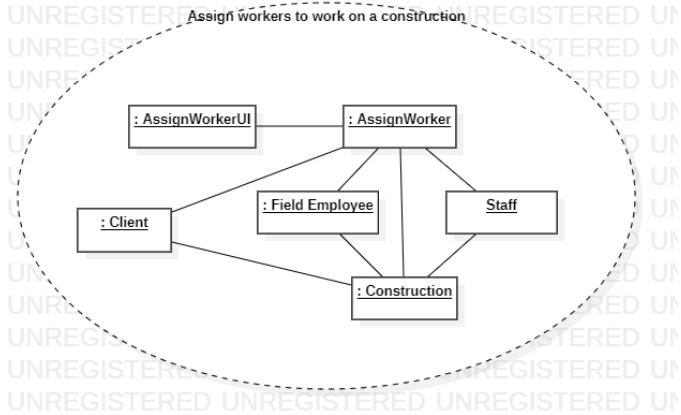


Figure 3.1.16: Collaboration diagram of Assign workers to work on a construction

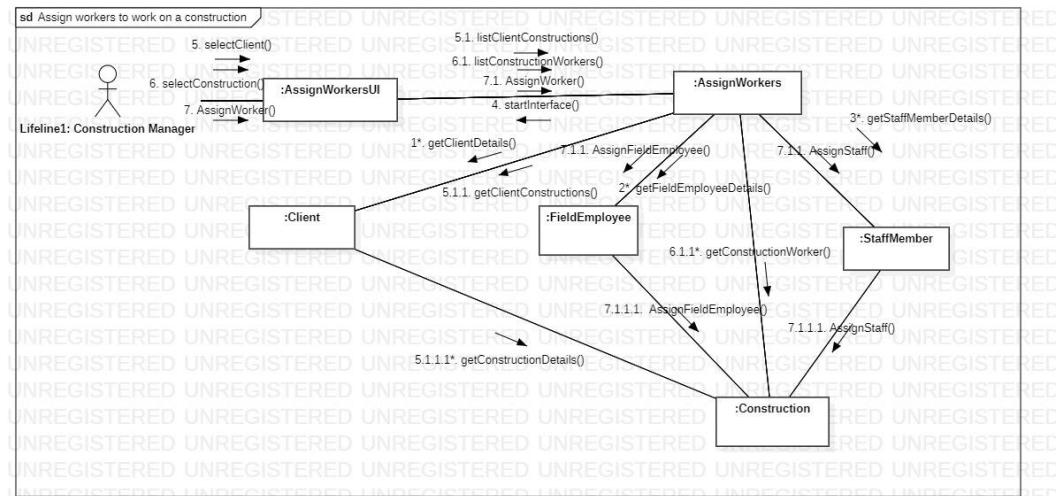


Figure 3.1.17: Communication diagram of Assign workers to work on a construction

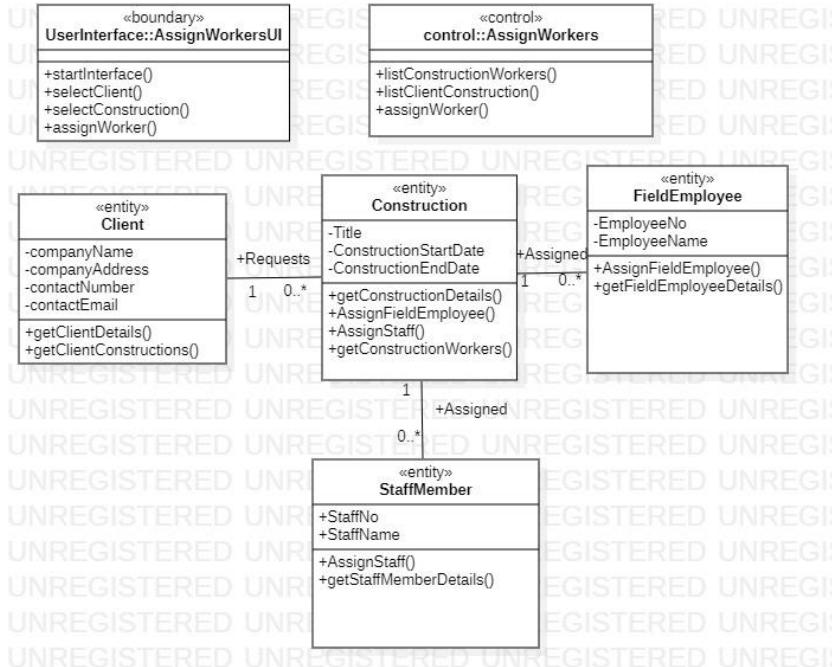


Figure 3.1.18: Use case class diagram of Assign workers to work on a construction

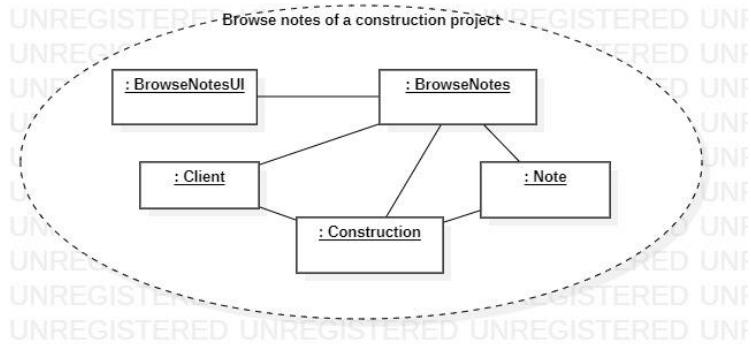


Figure 3.1.19: Collaboration diagram of Browse notes of a construction project

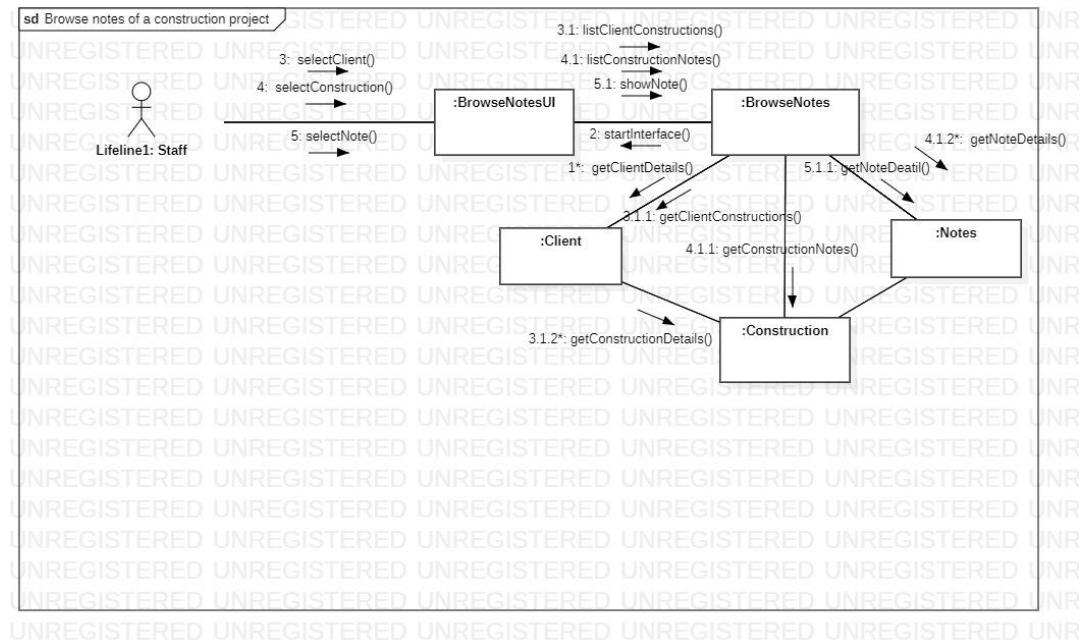


Figure 3.1.20: Communication diagram of Browse notes of a construction project

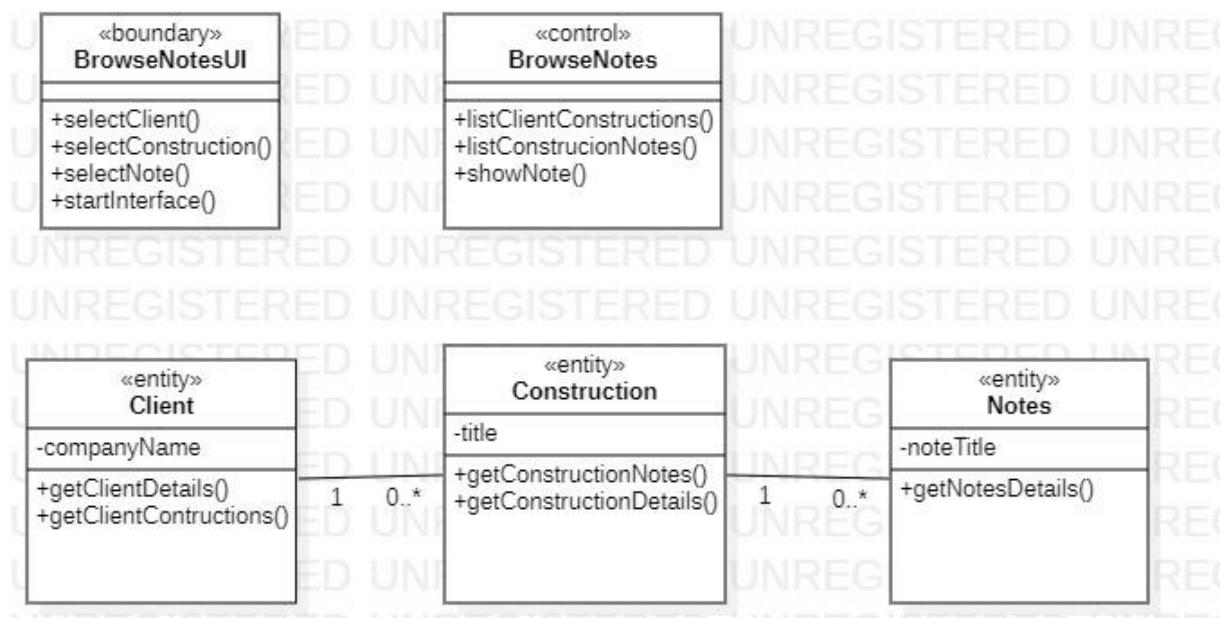


Figure 3.1.21: Use case class diagram of Browse notes of a construction project

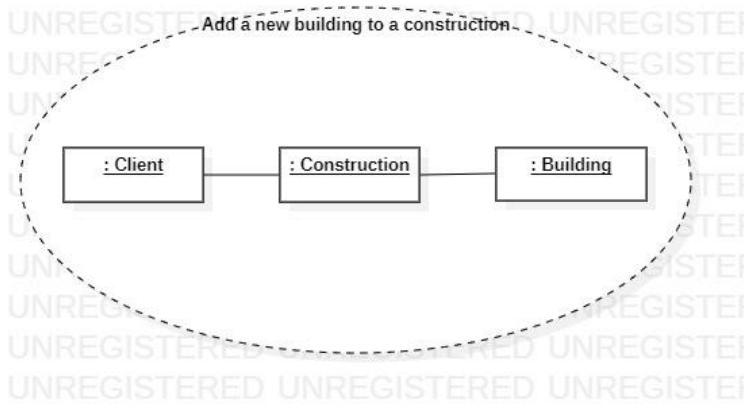


Figure 3.1.22: Collaboration diagram of Add a new building to a construction

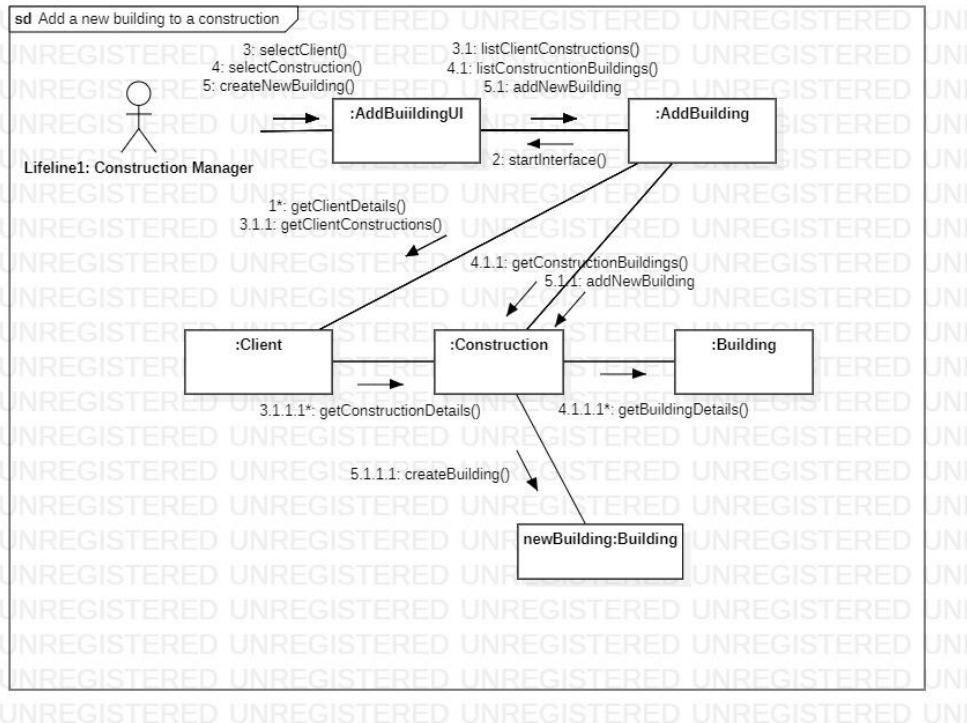


Figure 3.1.23: Communication diagram of Add a new building to a construction

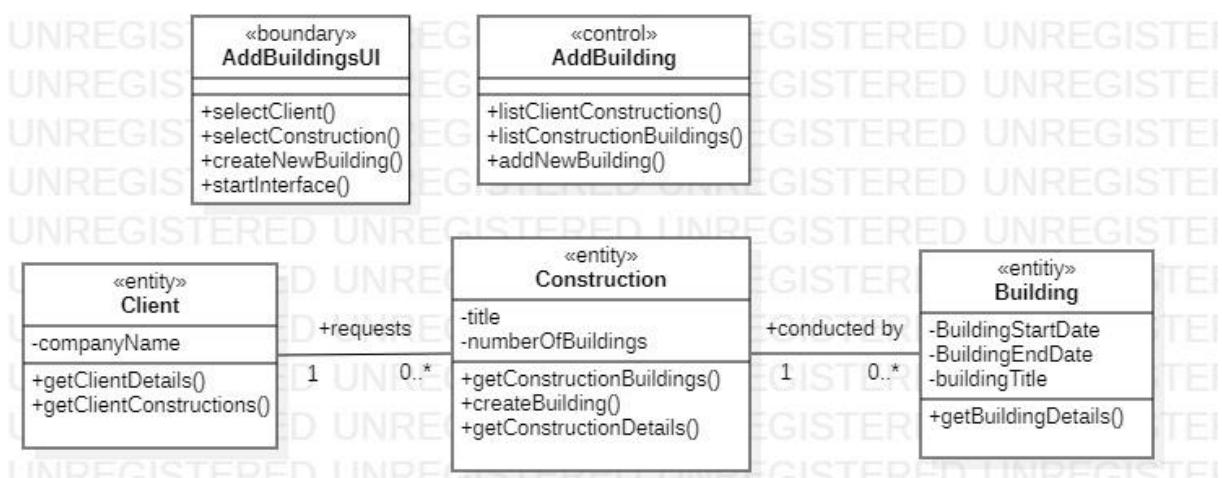


Figure 3.1.24: Use case class diagram of Add a new building to a construction

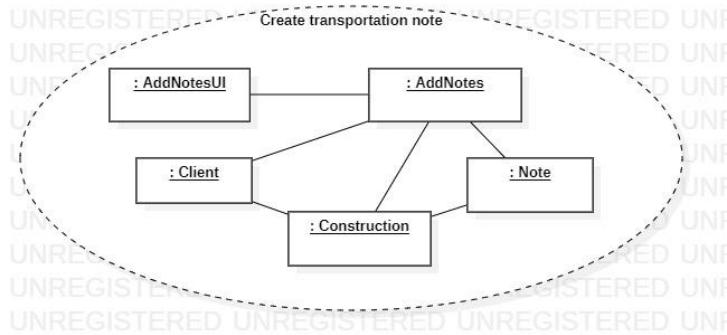


Figure 3.1.25: Collaboration diagram of Create transportation note

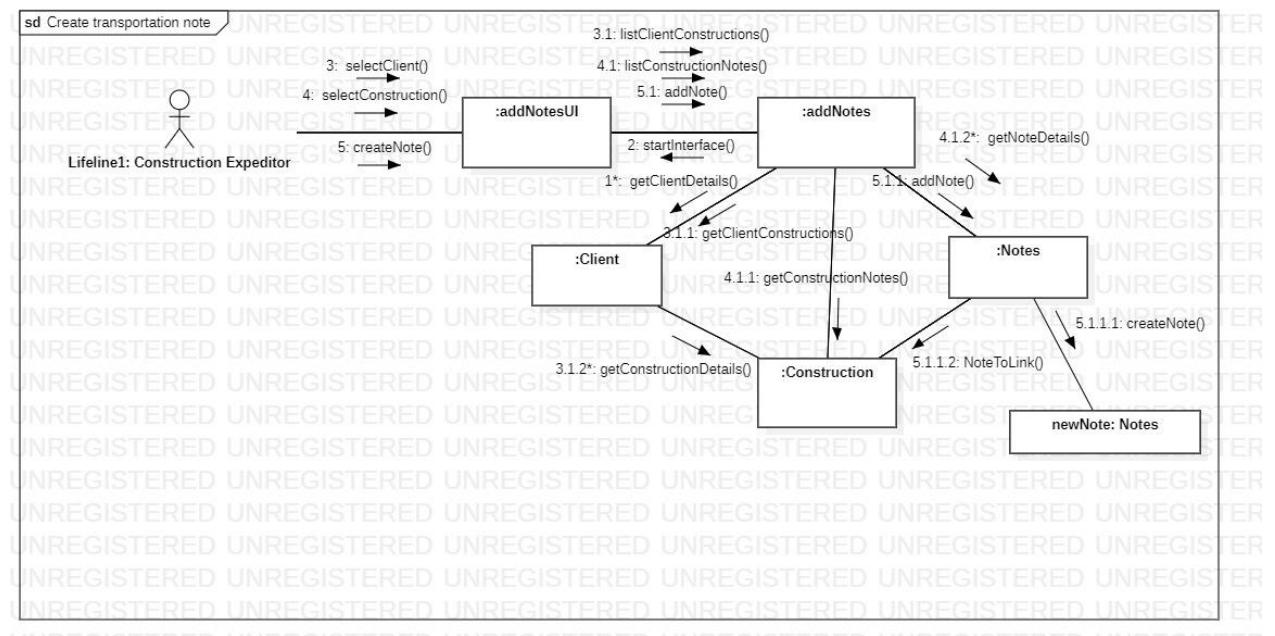


Figure 3.1.26: Communication diagram of Create transportation note

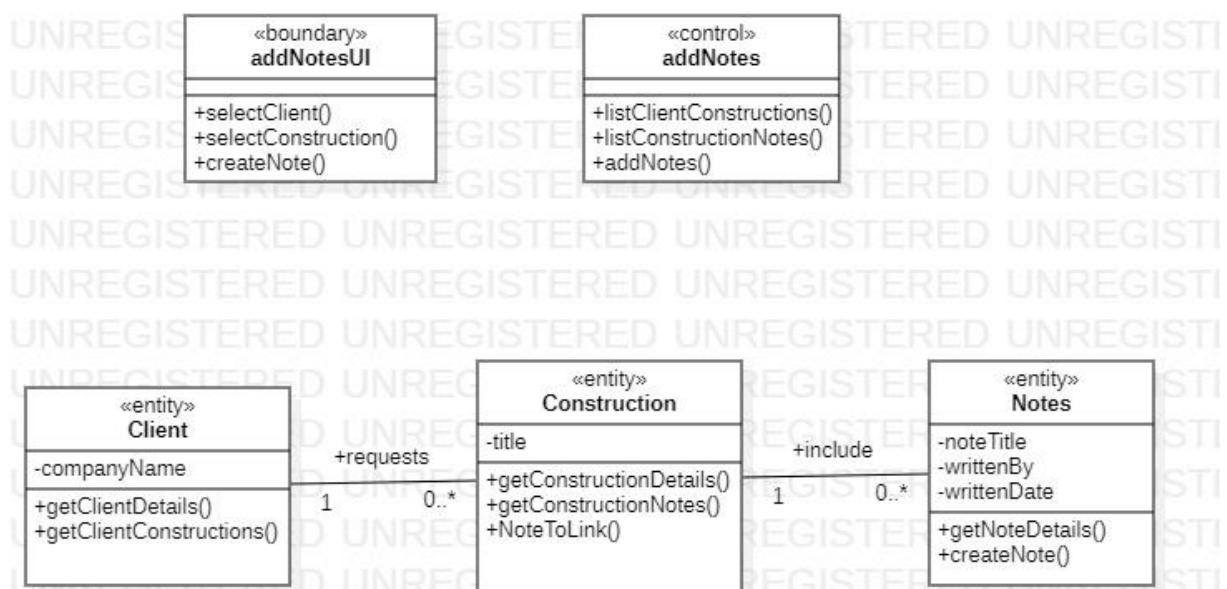


Figure 3.1.27: Use case class diagram of Create transportation note

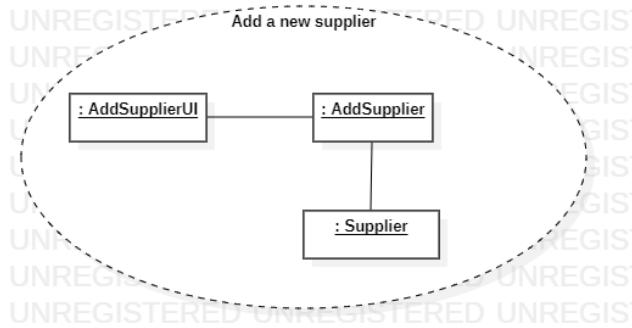


Figure 3.1.28: Collaboration diagram of Add a new supplier

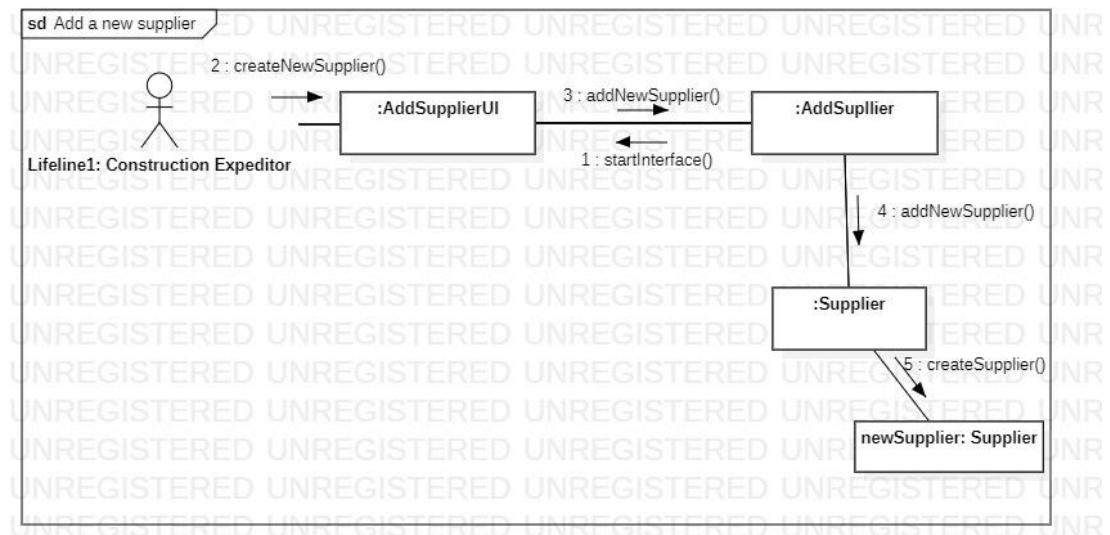


Figure 3.1.29: Communication diagram of Add a new supplier



Figure 3.1.30: Use case class diagram of Add a new supplier

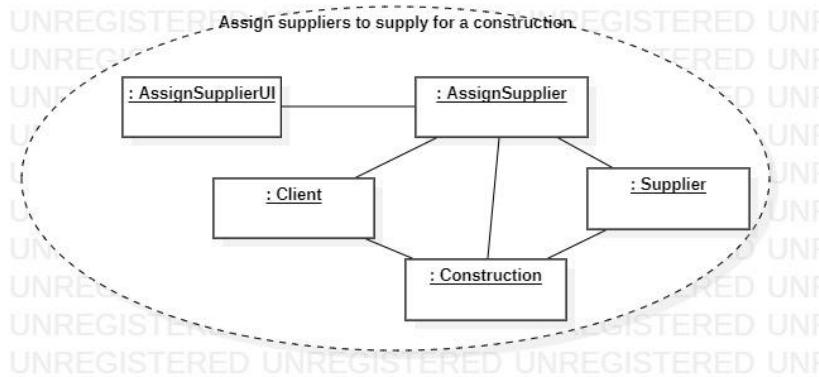


Figure 3.1.31: Collaboration diagram of Assign suppliers to supply for a construction

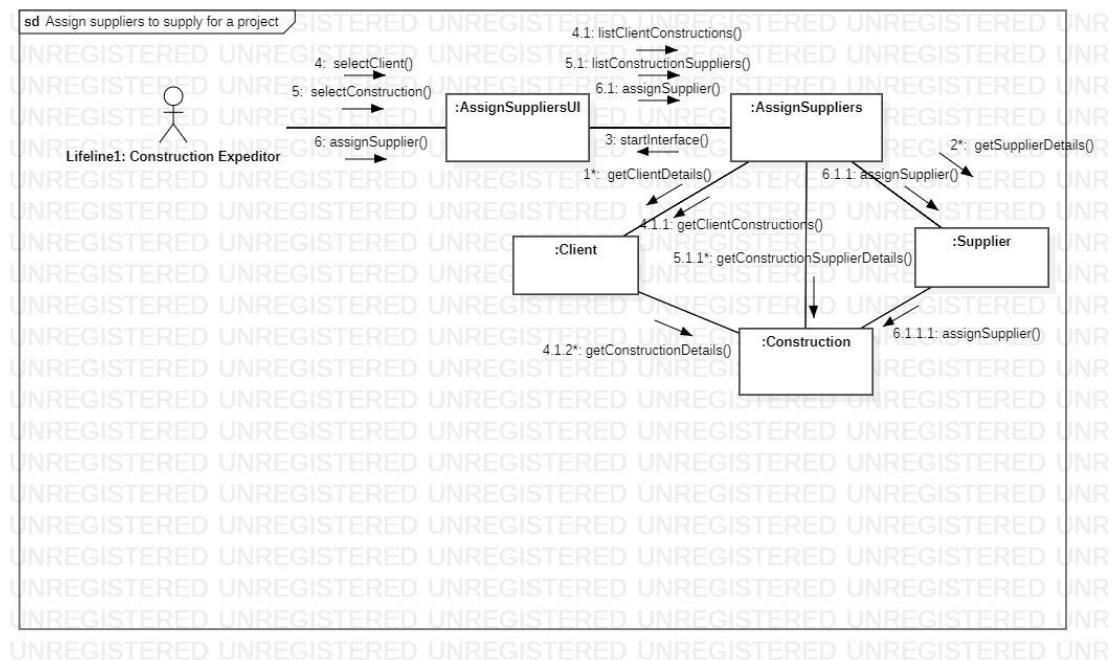


Figure 3.1.32: Communication diagram of Assign suppliers to supply for a construction

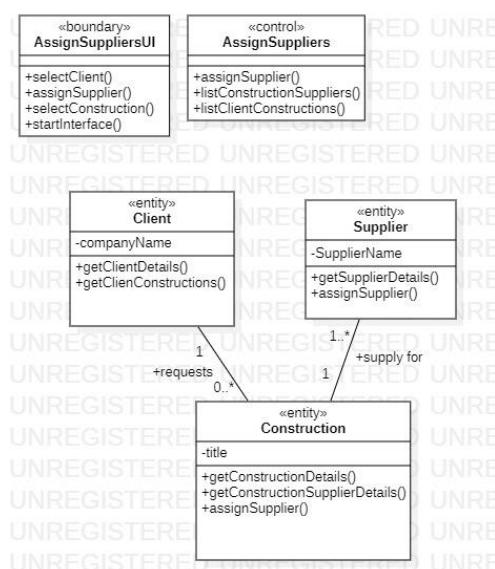


Figure 3.1.33: Use case class diagram of Assign suppliers to supply for a construction

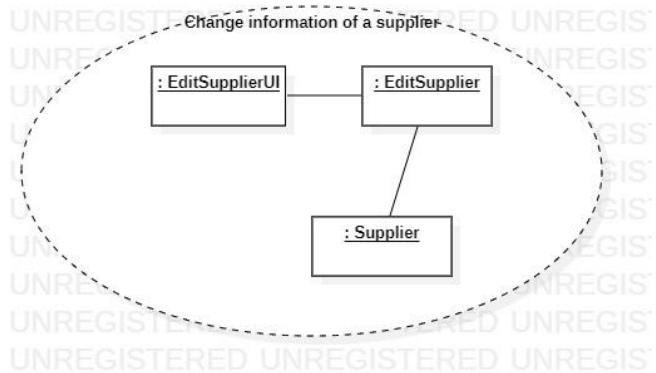


Figure 3.1.34: Collaboration diagram of Change information of a supplier

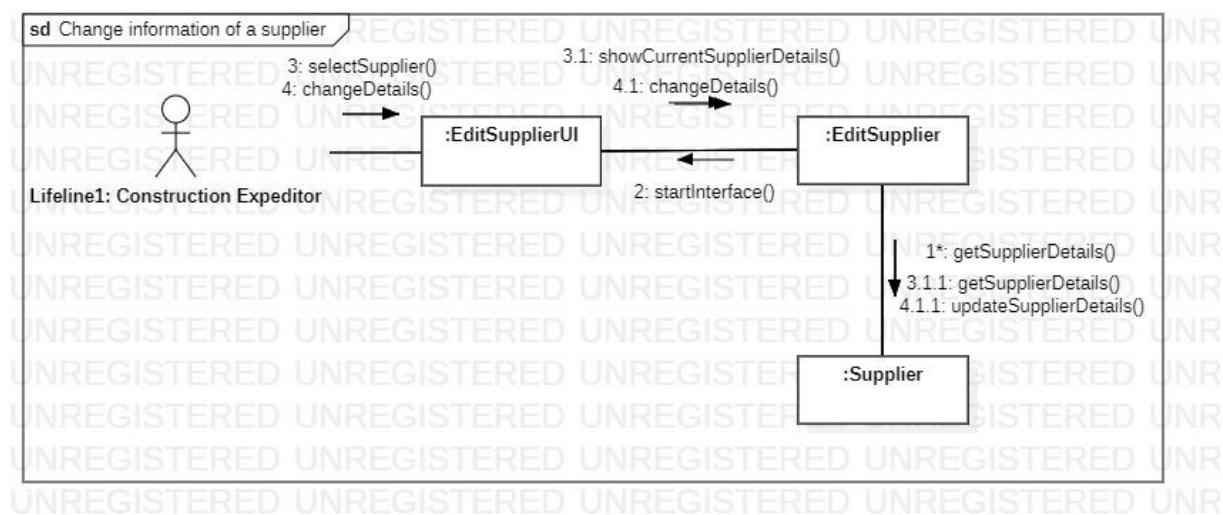


Figure 3.1.35: Communication diagram of Change information of a supplier

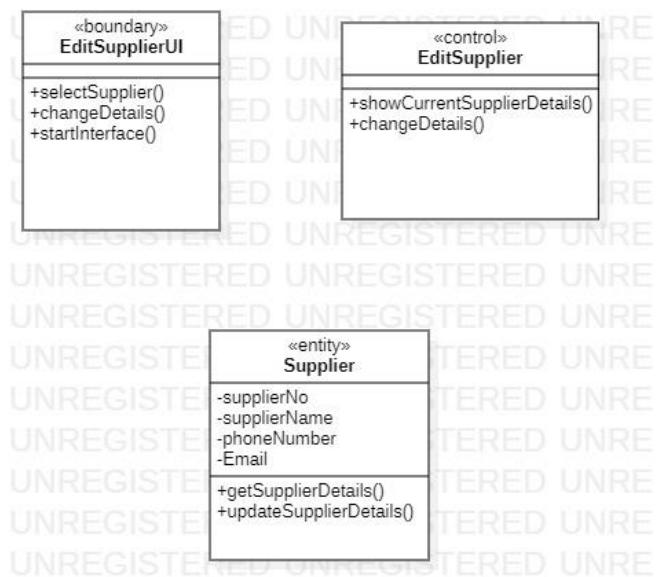


Figure 3.1.36: Use case class diagram of Change information of a supplier

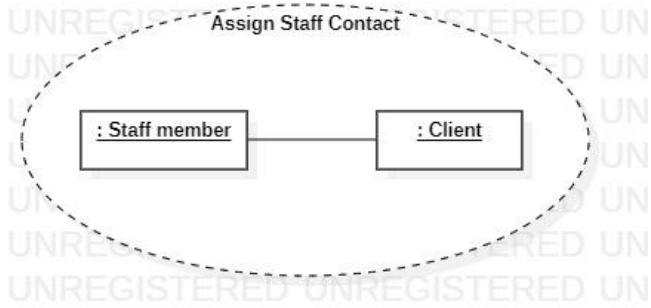


Figure 3.1.37: Collaboration diagram of Assign staff contact

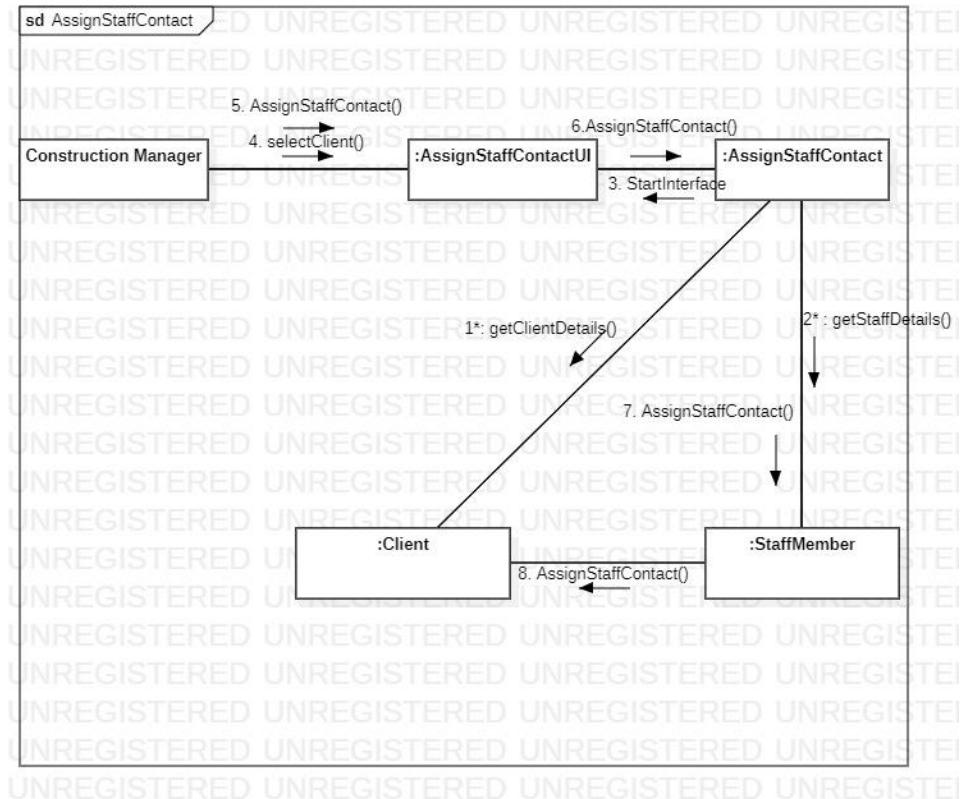


Figure 3.1.38: Communication diagram of Assign staff contact

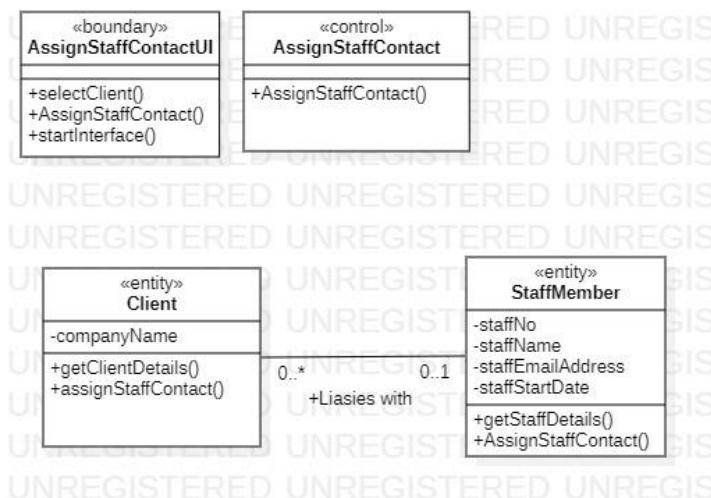


Figure 3.1.39: Use case class diagram of Assign staff contact

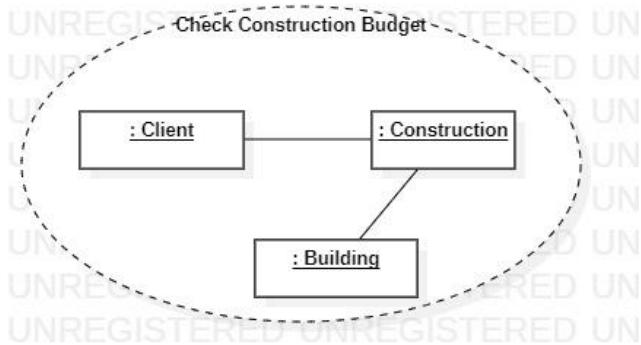


Figure 3.1.40: Collaboration diagram of Check Construction Budget

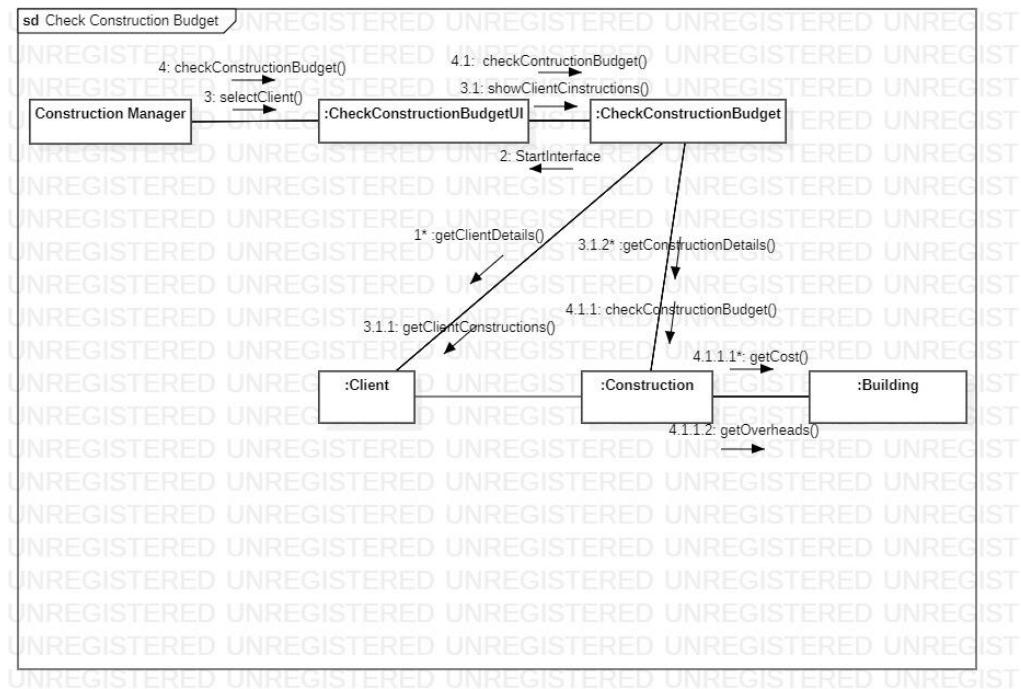


Figure 3.1.41: Communication diagram of Check Construction Budget

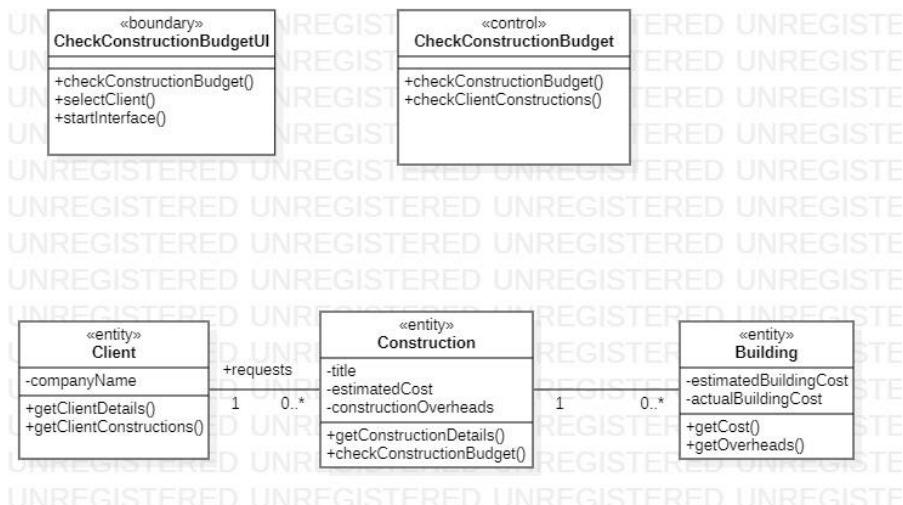


Figure 3.1.42: Use case class diagram of Check Construction Budget

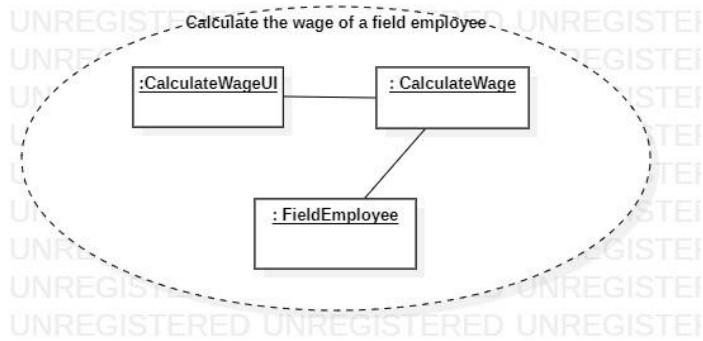


Figure 3.1.43: Collaboration diagram of Calculate the wage of a field employee

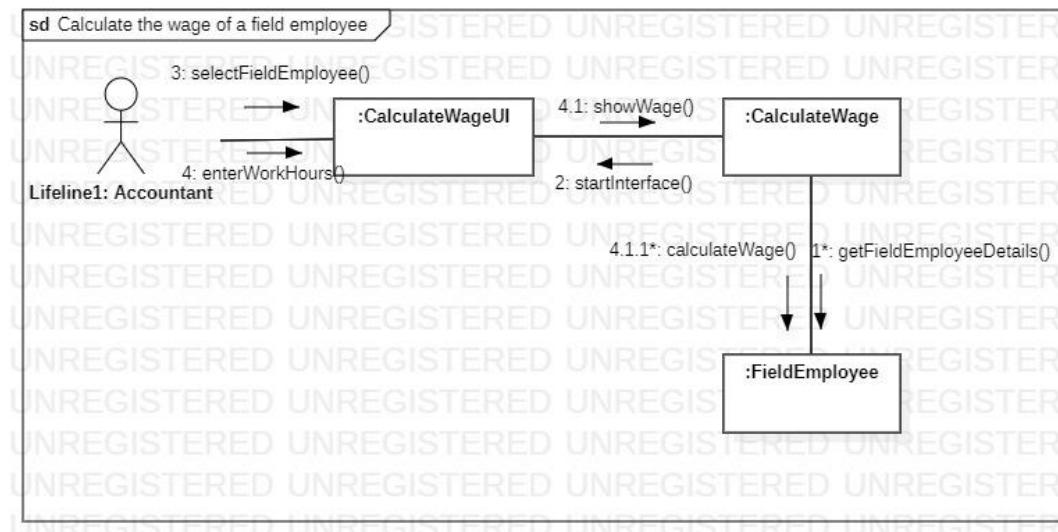


Figure 3.1.44: Communication diagram of Calculate the wage of a field employee

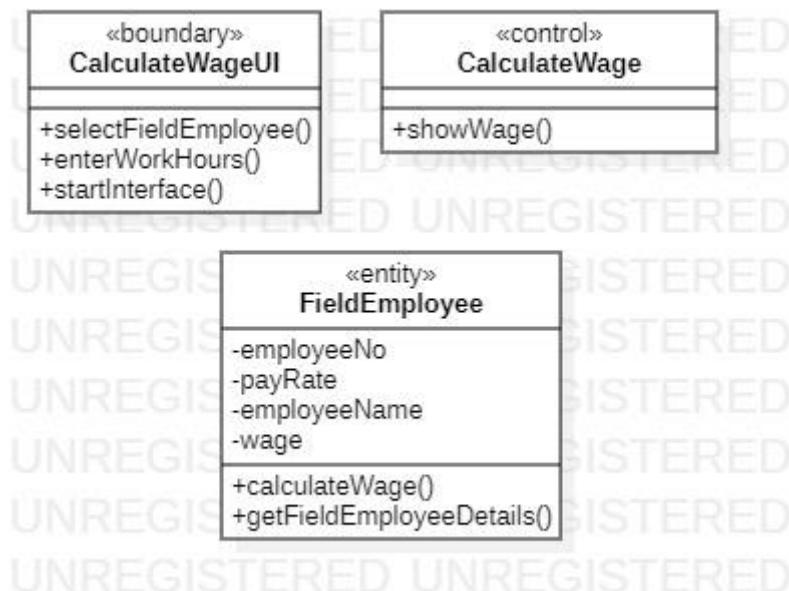


Figure 3.1.45: Use case class diagram of Calculate the wage of a field employee

3.2- Analysis Class Diagram

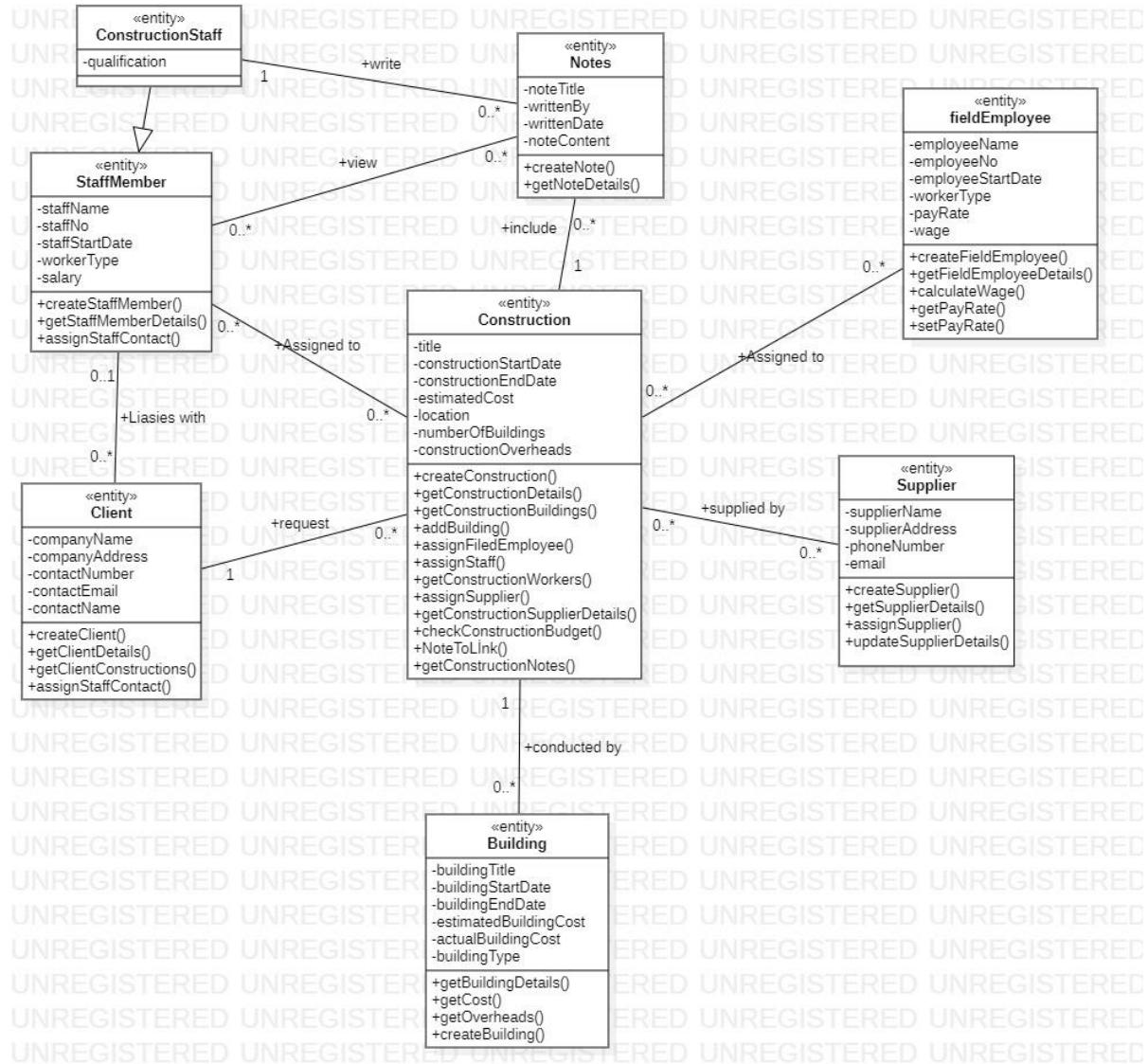


Figure 3.2.1: Analysis Class Diagram

4. Further Analysis

4.1- Sequence Diagrams

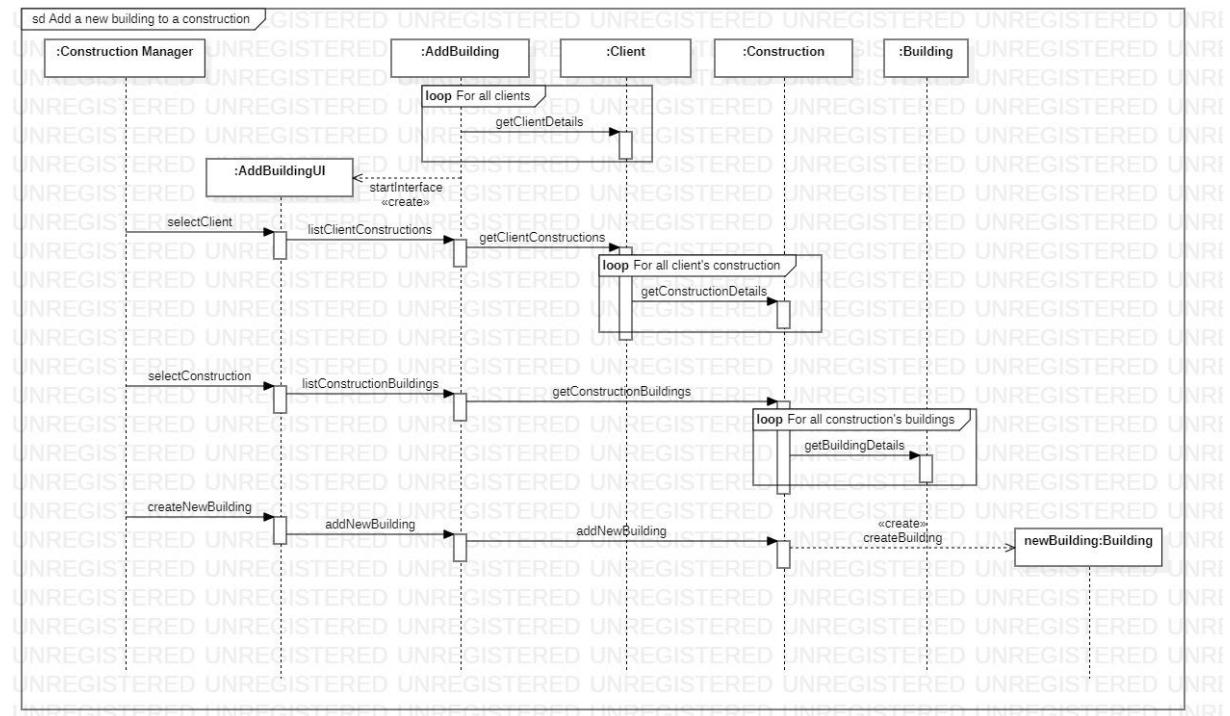


Figure 4.1.1: Sequence diagram of Add a new building to construction

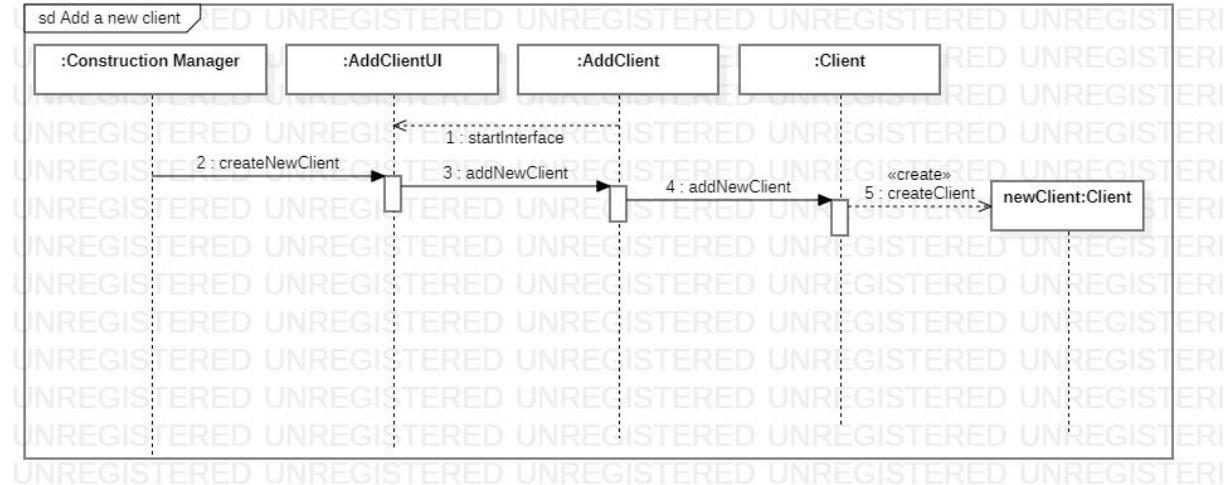


Figure 4.1.2: Sequence diagram of Add a new client

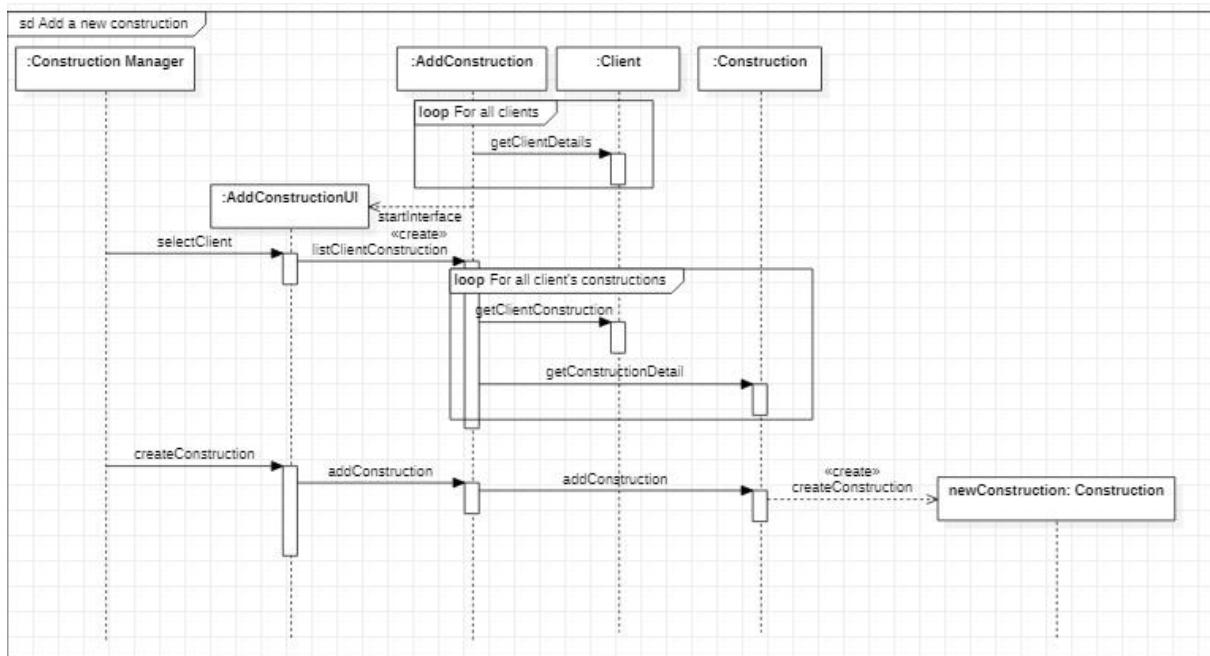


Figure 4.1.3: Sequence diagram of Add a new construction

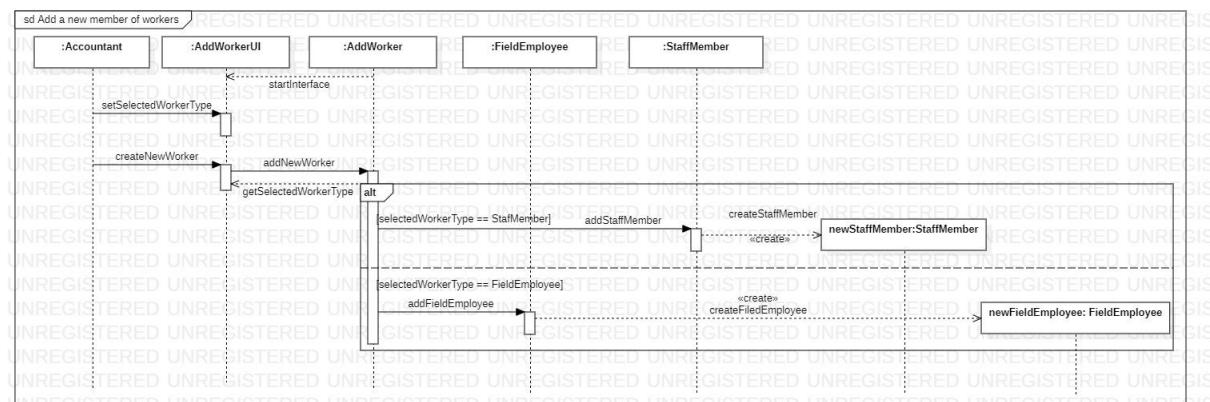


Figure 4.1.4: Sequence diagram of Add a new member of workers

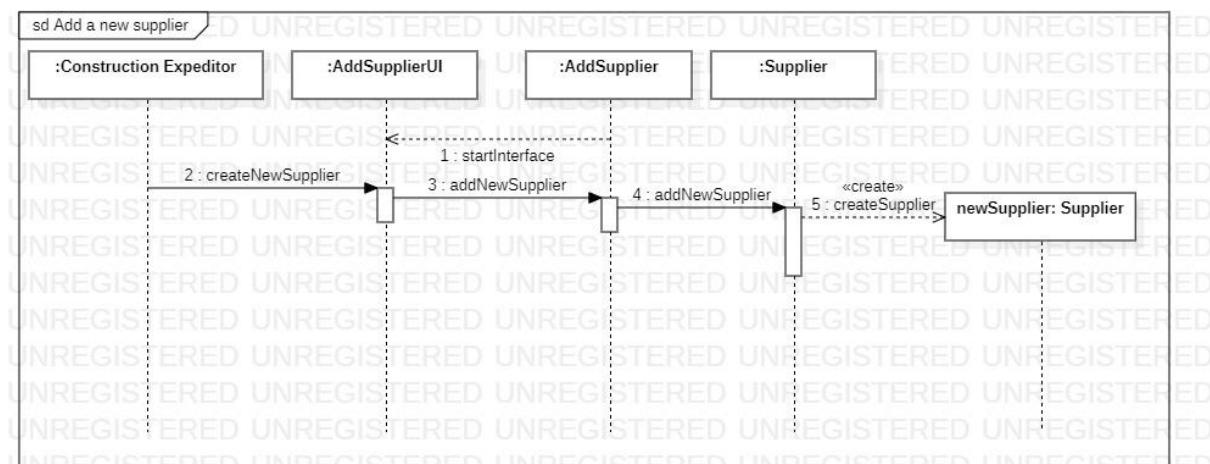


Figure 4.1.5: Sequence diagram of Add a new supplier

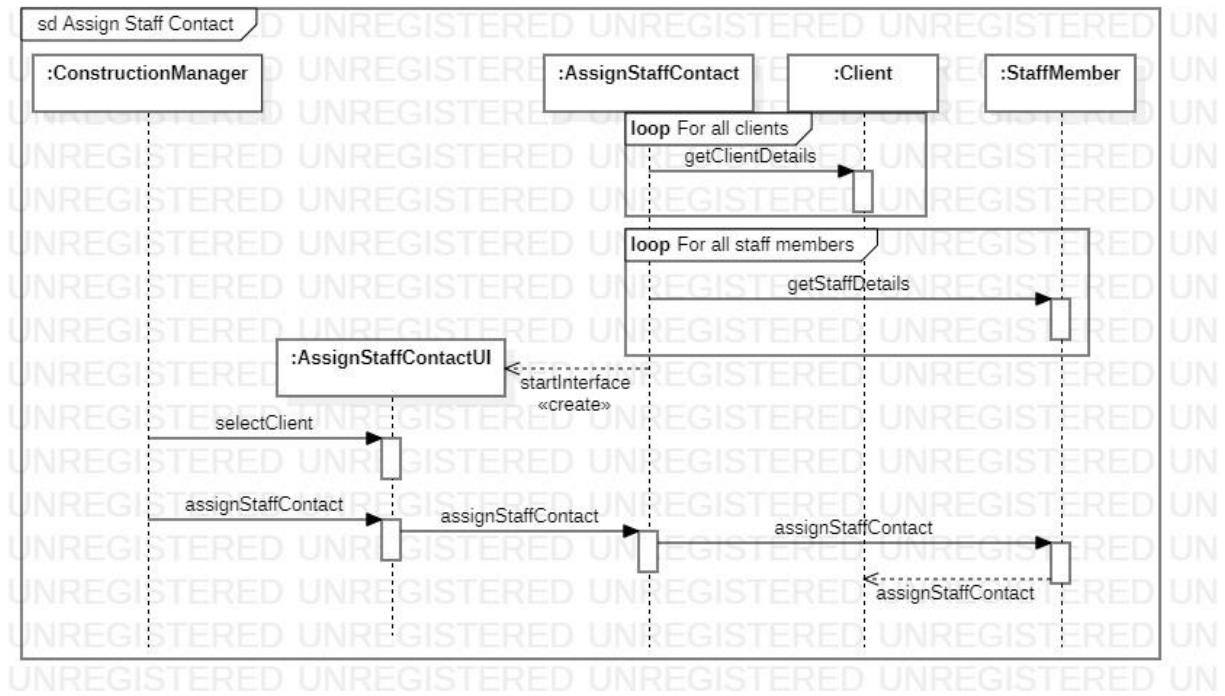


Figure 4.1.6: Sequence diagram of Assign a staff contact

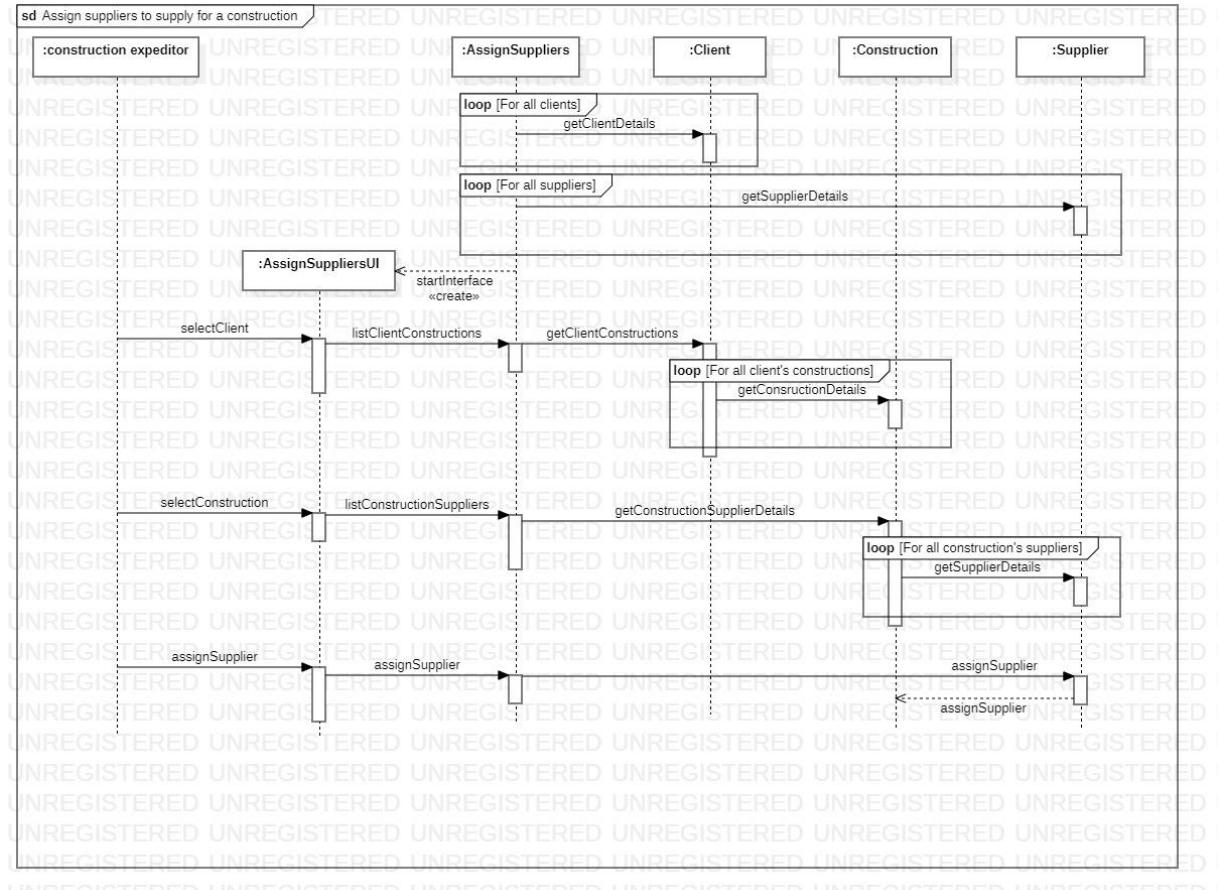


Figure 4.1.7: Sequence diagram of Assign suppliers to supply for a project

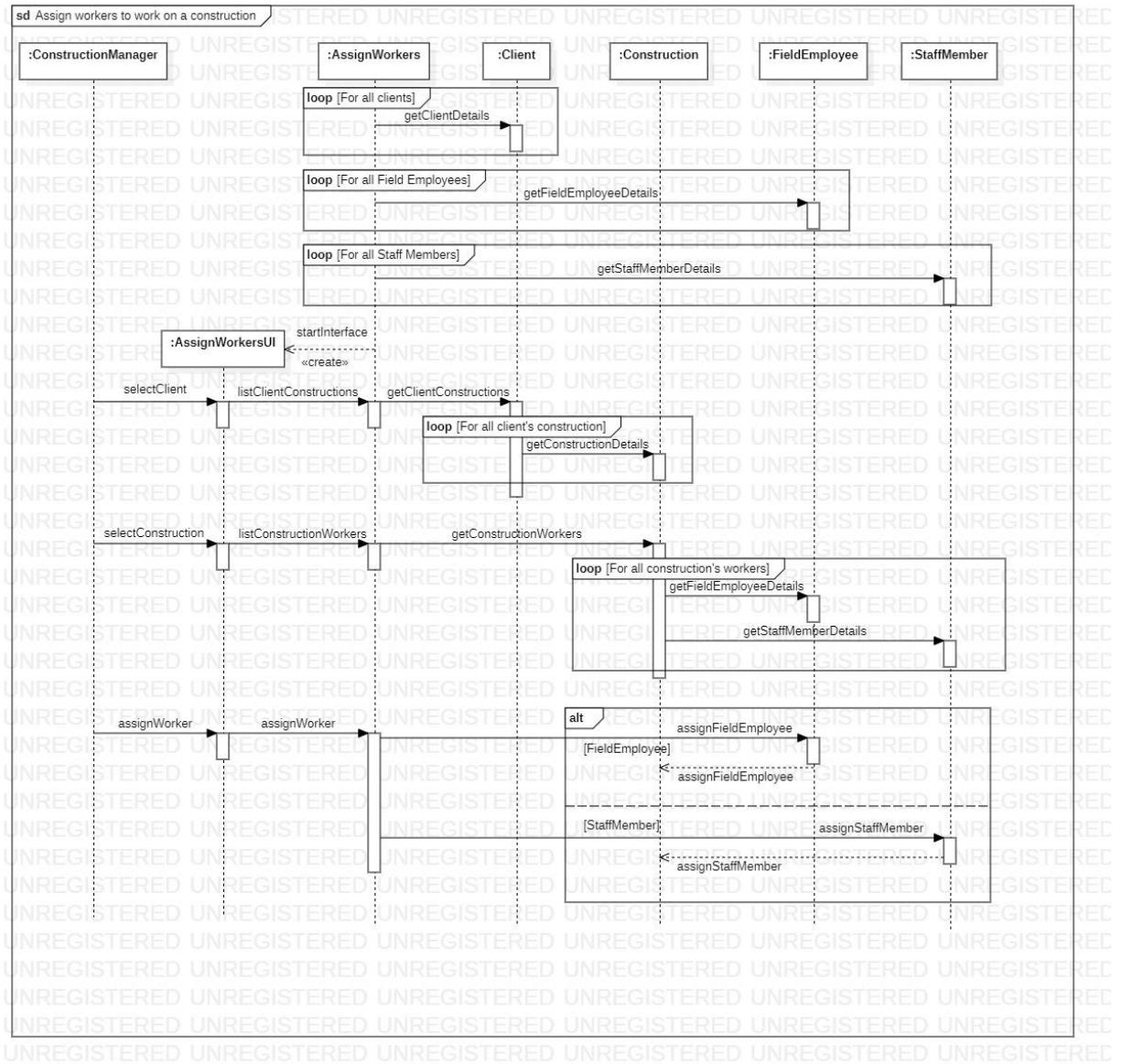


Figure 4.1.8: Sequence diagram of Assign workers to work on a construction

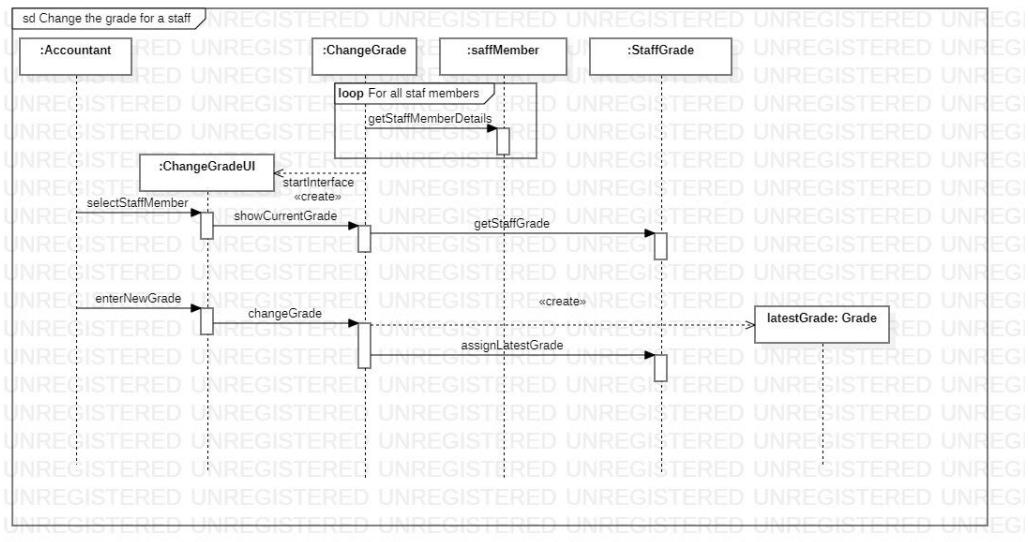


Figure 4.1.9: Sequence diagram of Change the grade for a staff

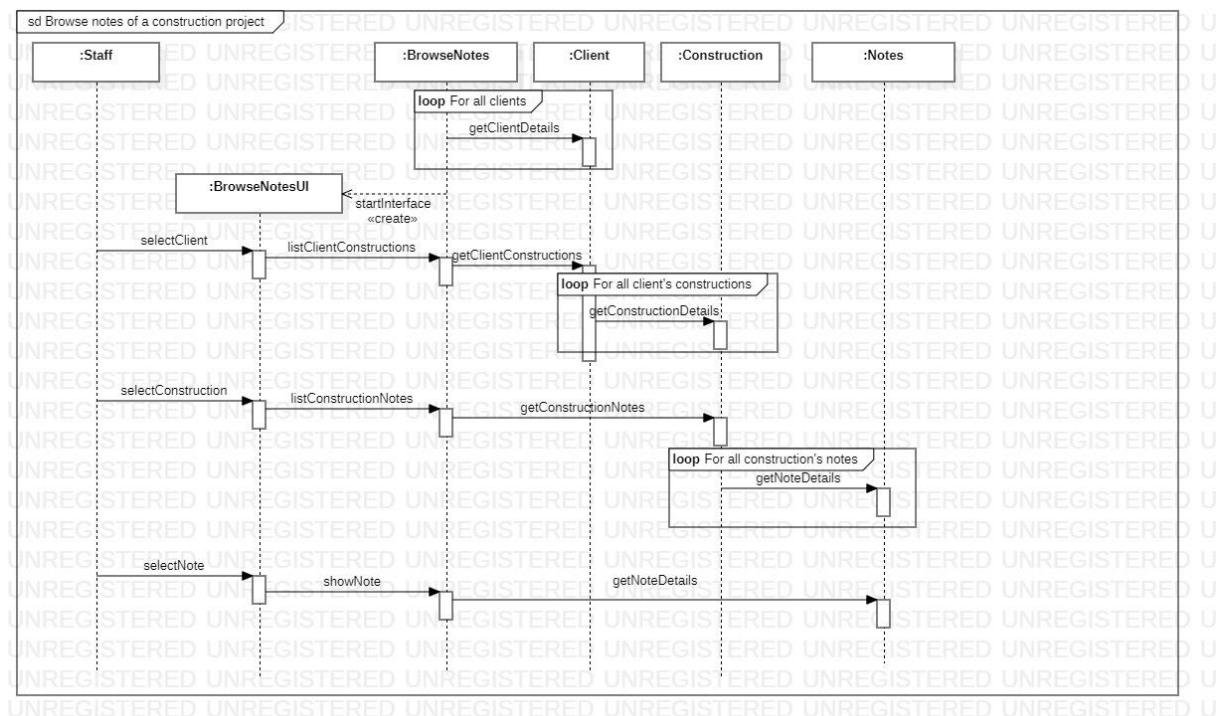


Figure 4.1.10: Sequence diagram of Browse notes of a construction project.

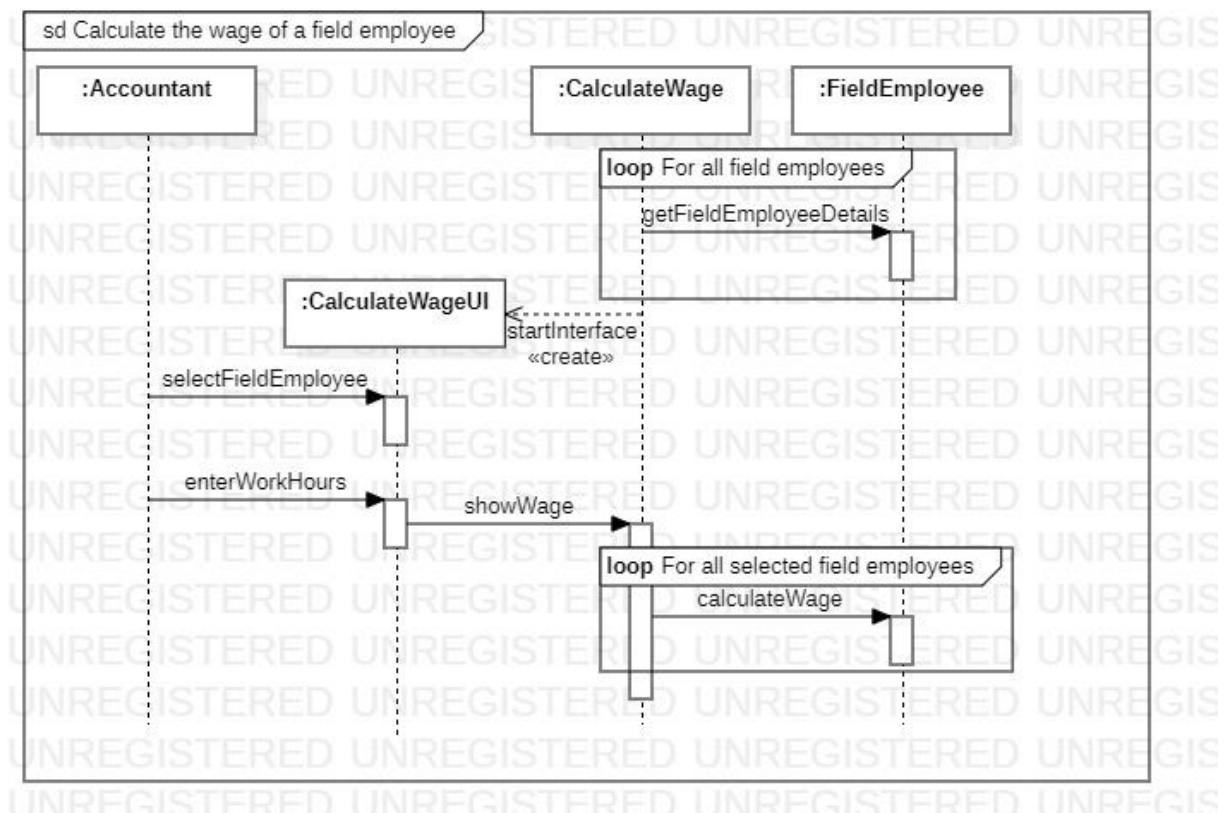


Figure 4.1.11: Sequence diagram of Calculate the wage of a field employee.

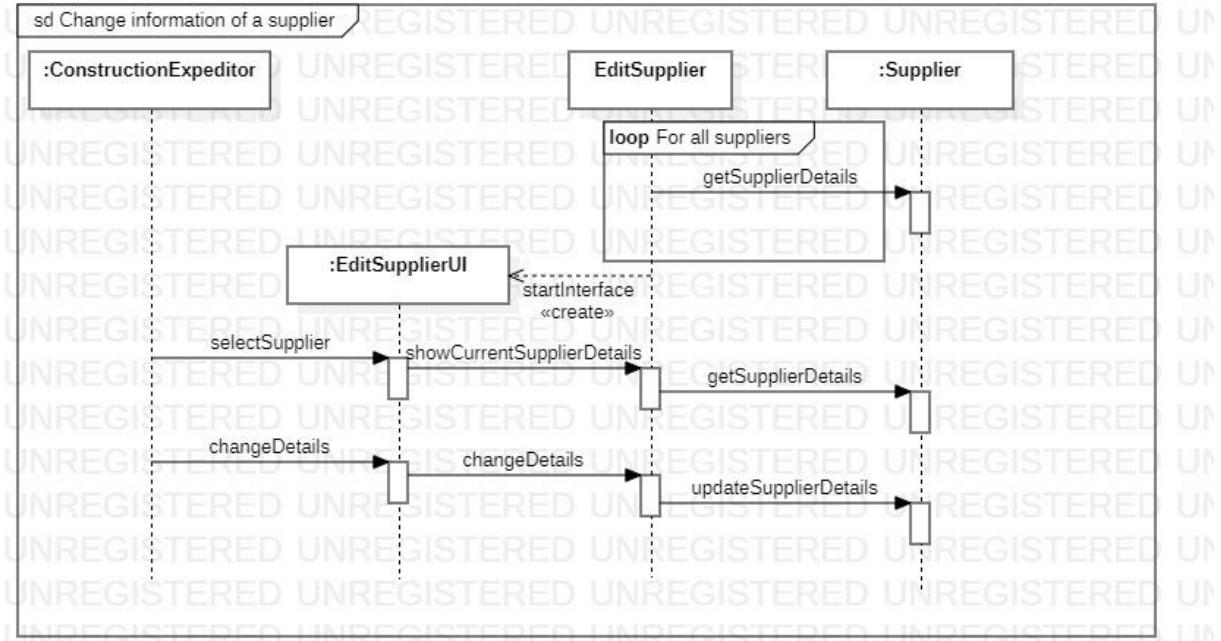


Figure 4.1.12: Sequence diagram of Change information of a supplier

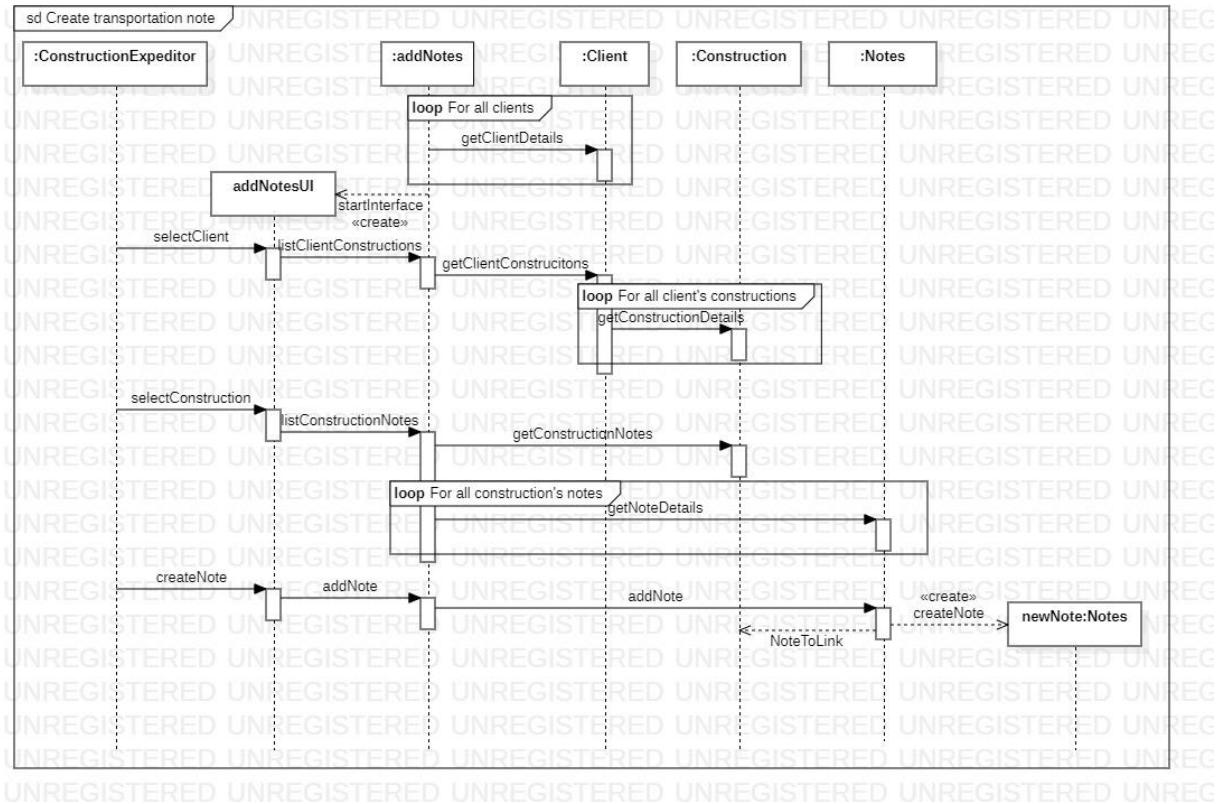


Figure 4.1.13: Sequence diagram of Create transportation note

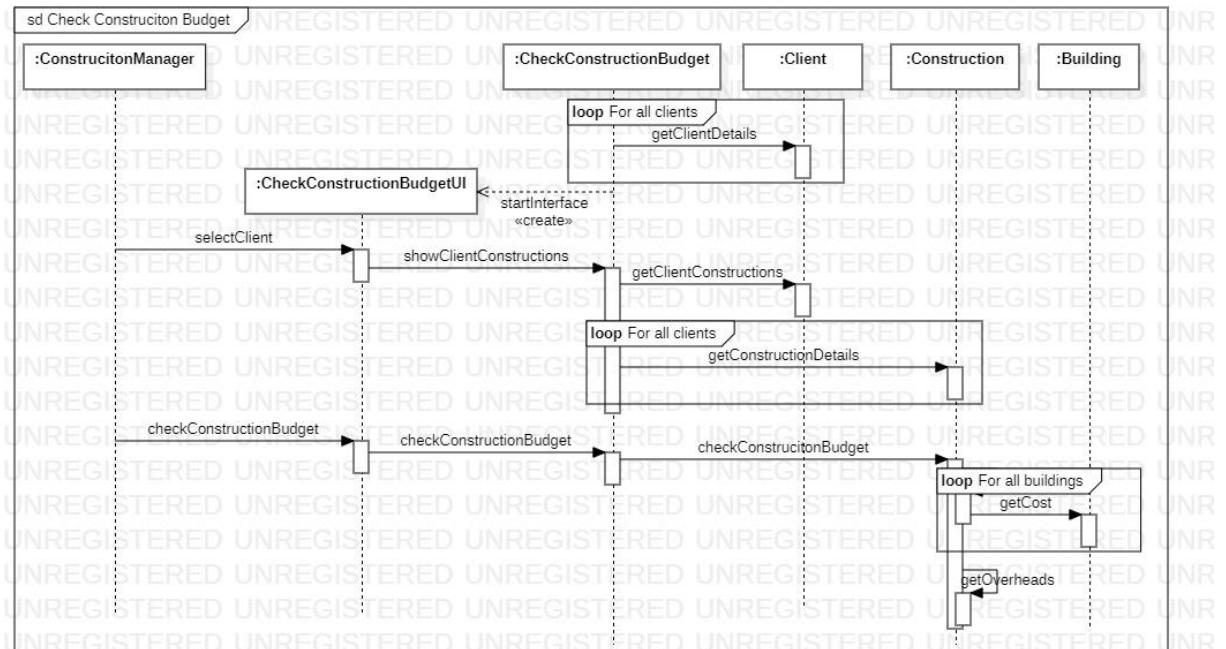


Figure 4.1.14: Sequence diagram of Check construction budget.

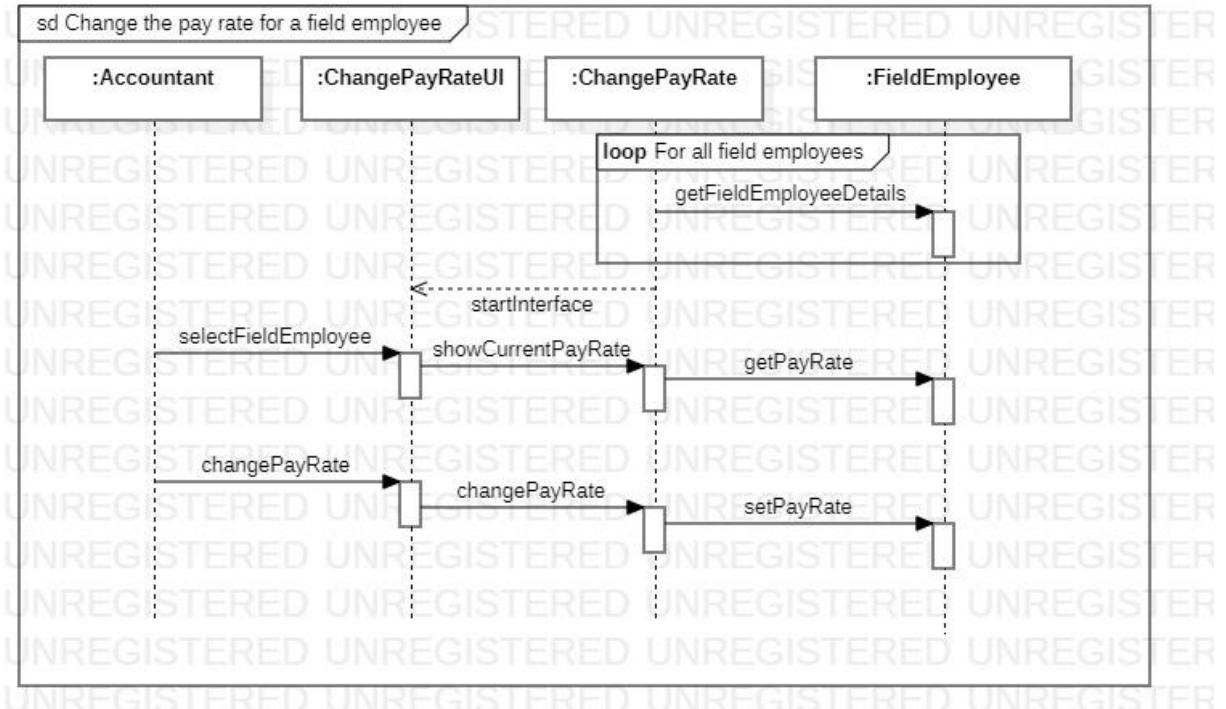


Figure 4.1.15: Sequence diagram of Change the pay rate for a field employee

4.2- Further Analysis Class Diagram

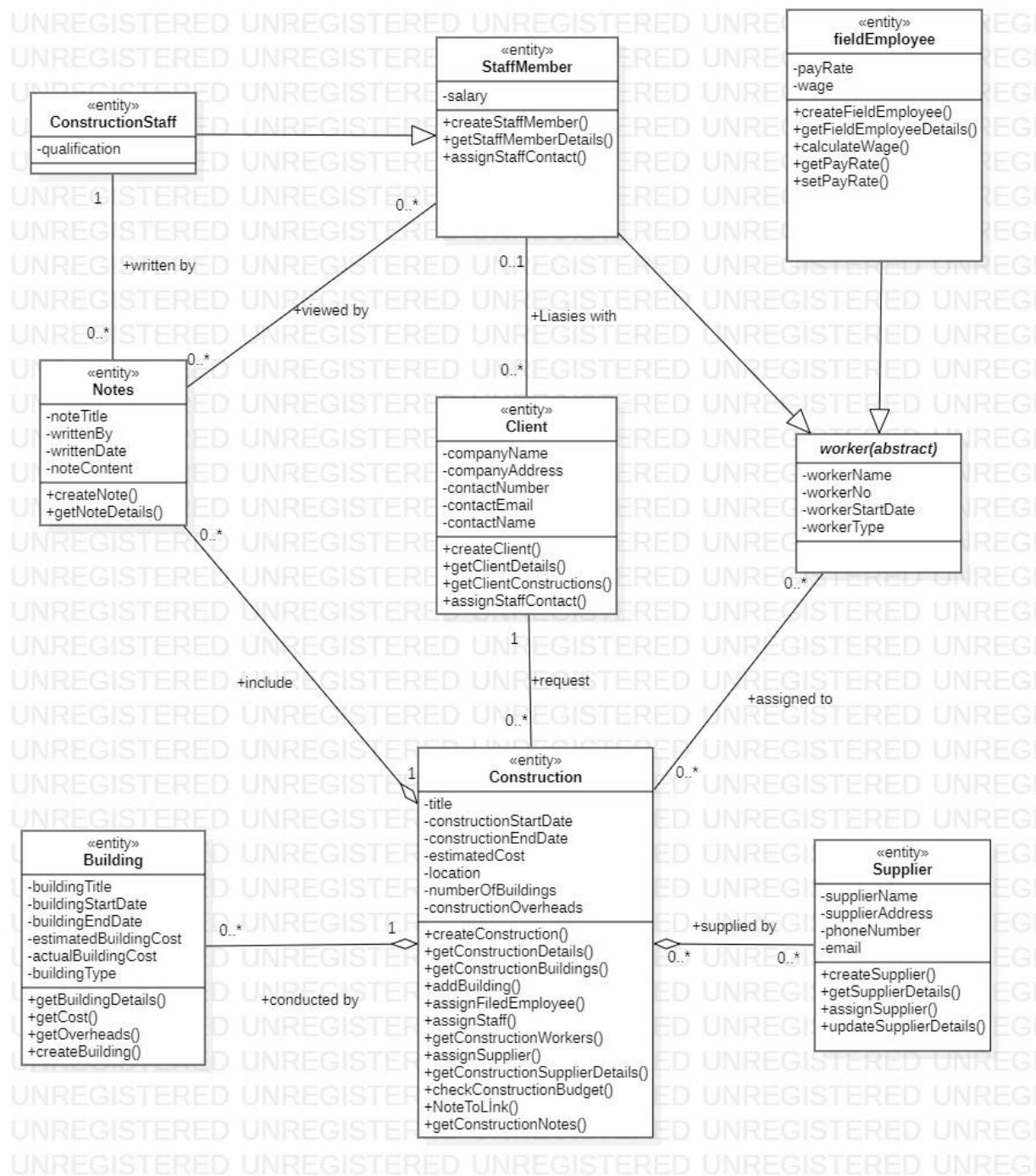


Figure 4.2.1: Further Analysis Class Diagram

5. Moving into design

5.1- Final System Architecture

System has four-layer architecture. Maidel boundary is presentation layer, Maidel control client and server is application logic layer. Finally, Maidel domain and database are respectively domain and database layers. All user interface systems are in Maidel Boundary package. All control components of the user interfaces that provides the necessary communication between user interfaces and entities are in Maidel control client and server packages. In Maidel domain layer, you can see that there are two packages, which are Construction Management and Worker Management. Construction management reflects the business objectives of Maidel and consists of two sub-packages that are Construction Plan and Supplier Management. Construction plan is to deal how a construction or buildings in it will be built and which workers are be part of it. Supplier Management is to deal with the relation of a supplier with the construction objects and to arrange the attribute of suppliers. Worker management is to arrange the information of all workers that are currently working for Maidel. Finally, all entities and their attributes are stored in Maidel Database that is implemented with MongoDB.

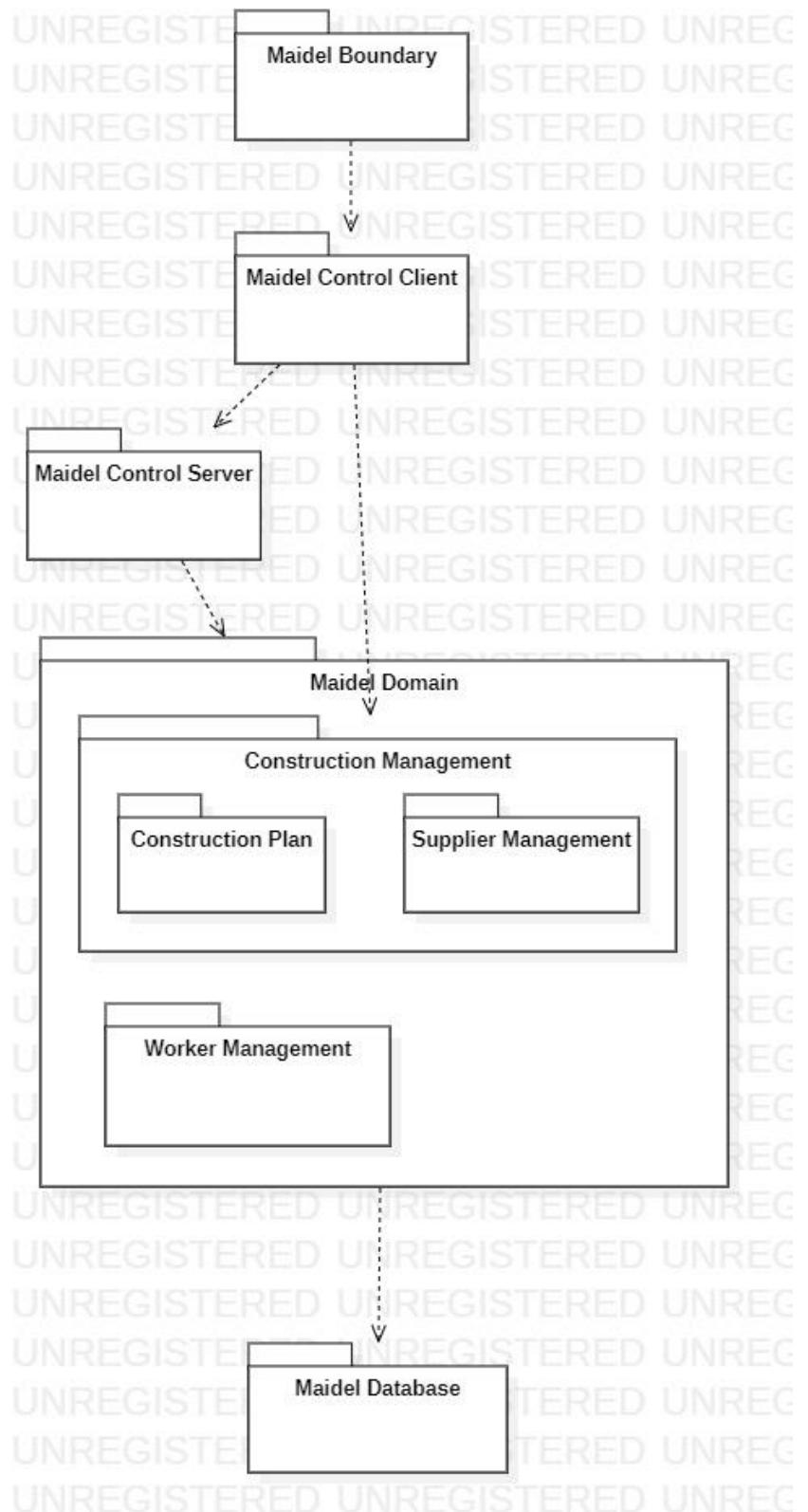


Figure 5.1.1: Final package architecture

5.2- Detailed Class Diagram

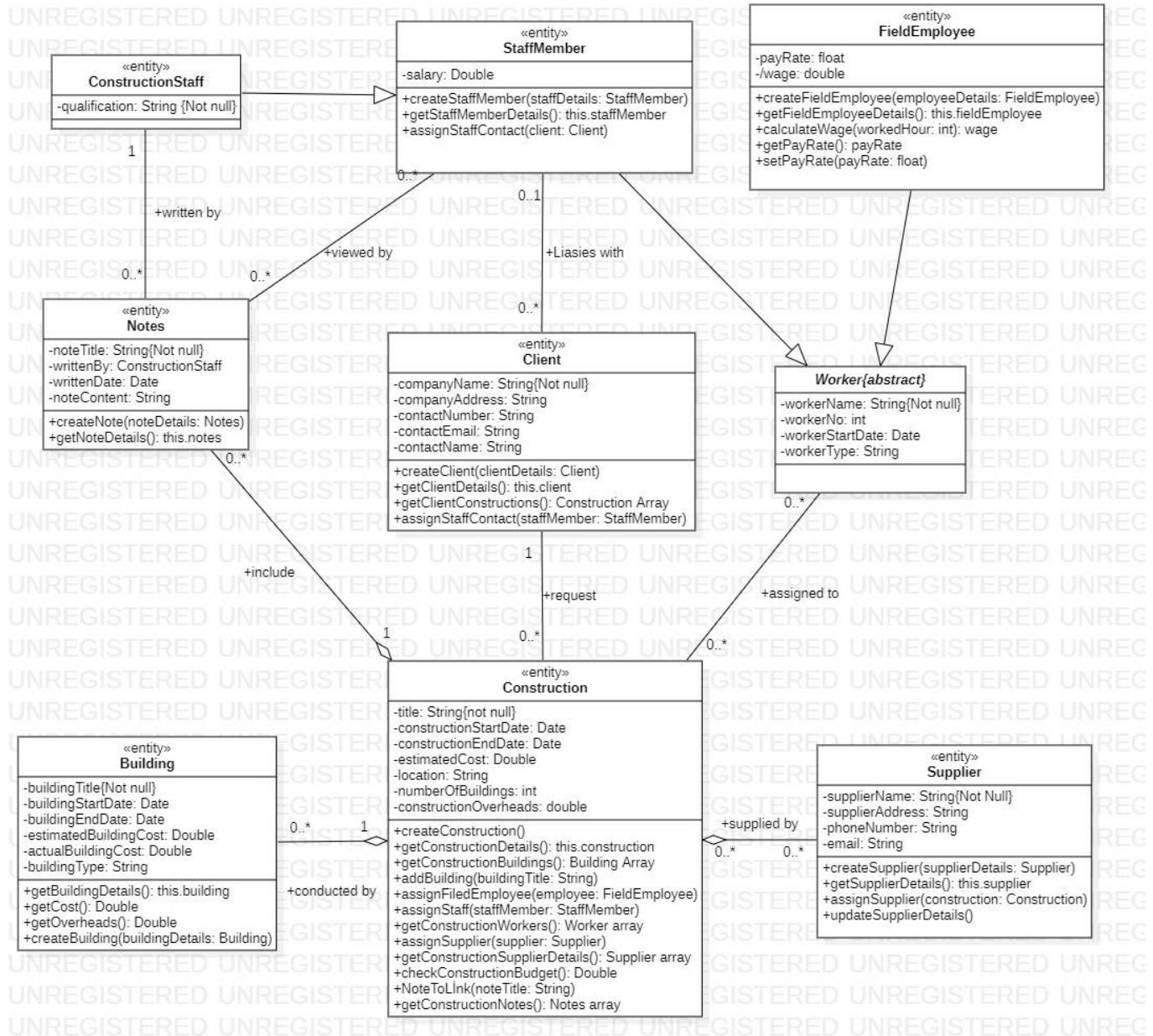


Figure 5.2.1: Detailed Class Diagram