Request for Research
on Fire Fighting Systems

1- A Typical **Hotel building located in Cairo City on Nile River** consists of 2 basements (**B1+B2**), Ground Floor (**G**), **14 Typical Floors** (from **1st floor to 14th floor**), and the roof annex, as can be seen in **Figure 1.** Each of the Typical Floor consists of 20 Guest Rooms (numbered by including the floor number plus numbers from 01 to 12, and 14 to 21), elevator lobby, service corridor, IT room, and MDB room. The fire water tank and pump room will be located in 2nd basement floor (**B2**), as can be seen on Figure 1. Each Student is requested to Prepare his/her **Conceptual Design Report for the firefighting works for this hotel building** in not more than 10 pages, including the **hydraulic calculations for automatic water sprinkler system** to protect the highest floor (14th floor) and to **include the following items, calculations and diagrams/drawings**:

a) ***Select, Specify*** and ***List*** in a table the **proposed firefighting system(s)** and their system components for all the specified spaces inside all floors of the Hotel building**, *in Tabulated Format.***

b) ***Plot*** a **schematic drawing** for the proposed **Riser Diagram** for **Fire Fighting system(s)** on the attached building Sectional Elevation presented in **Figure 1**, using water based system consists of **Fire Pumping Set (or Two Fire Pumping Sets)** (**FP**s), Fire water Tank (**FWTs**) with specified water storage capacity, (**automatic water sprinklers** (**SP**s), **Fire Hose Cabinets** (**FHC**s). Use CAD file Or manual drawings to indicate the using of One Fire Fighting pumping system with **pressure reducing valves (PRVs)** in some floors, if needed, as per **NFPA13** requirements.

c) ***Design*** and ***Plot*** a **schematic drawing** for the proposed automatic water sprinklers system and Fire Hose Cabinets system for the floor number 14th, which its architecture plan view is presented in **Figure 2**, as the hydraulically most remote floor, taking into consideration that that proposed sprinkler distribution could be used for all typical floors, using **side wall sprinklers for Guest Rooms** which are without reflected ceilings except the room entrance vestibules. However, **concealed pendant sprinklers** shall be used for room entrance vestibules, elevator lobbies, and service corridors in those typical floors, as per **NFPA13** requirements.

d) ***Calculate*** the **water Demand required** and **pump head** to provide the automatic water sprinkler system and the Fire Hose Cabinets system proposed in the above item, based on the diagram shown **Figure 3** for Fire Pumps Room connected to the Fire Stand pipe(s) and Riser(s) to serve the hotel building under consideration, as per **NFPA13 & NFPA20** requirements.

e) ***Design and Redraw*** a **schematic drawing** shown in **Figure 4** for **Fire Pumps Room located beside Fire Water Tank,** as per **NFPA20** requirements, respectively.

You are allowed to use CAD files or manual drawings to be attached to your Conceptual Design report for all the above items (from a to e).

Potable Water Tanks + Elevators Machine Room

Roof Annex …… Roof Annex

Guest Rooms 1401-1421 – Elevator Lobby + MDB + IT Room

14th floor ……14th floor

Guest Rooms 1301-1321 – Elevator Lobby + MDB + IT Room

13th floor ……13th floor

Guest Rooms 1201-1221 – Elevator Lobby + MDB + IT Room

12th floor ……12th floor

Guest Rooms 1101-1121 – Elevator Lobby + MDB + IT Room

11th floor ……11th floor

Guest Rooms 1001-1021 – Elevator Lobby + MDB + IT Room

10th floor ……10th floor

Guest Rooms 901-921 – Elevator Lobby + MDB + IT Room

9th floor …… 9th floor

Guest Rooms 801-821 – Elevator Lobby + MDB + IT Room

8th floor ……8th floor

Guest Rooms 701-721 – Elevator Lobby + MDB + IT Room

7th floor ……7th floor

Guest Rooms 601-621 – Elevator Lobby + MDB + IT Room

6th floor ……6th floor

Guest Rooms 501-521 – Elevator Lobby + MDB + IT Room

5th floor ……5th floor

Guest Rooms 401-421 – Elevator Lobby + MDB + IT Room

4th1 floor ……4th floor

Guest Rooms 301-321 – Elevator Lobby + MDB + IT Room

3rd floor ……3rd floor

Guest Rooms 201-221 – Elevator Lobby + MDB + IT Room

2nd floor …… 2nd floor

Guest Rooms 101-121 – Elevator Lobby + MDB + IT Room

1st floor …… 1st floor

Reception + Shops + Restaurant

Ground floor …… Ground floor

shops + Electrical rooms + MDBs room

Basement 1 …… Basement 1

Car Park + Fire Pump Room + Water Tanks+ Diesel Generating Set + Transformers

Basement 2 …… Basement 2

Figure 1: Sectional Elevation Diagram for NILE River Hotel Tower Building (Item a, b)

Note: This appendix shall be attached to your Conceptual Design Report and submitted after plot the necessary firefighting systems.

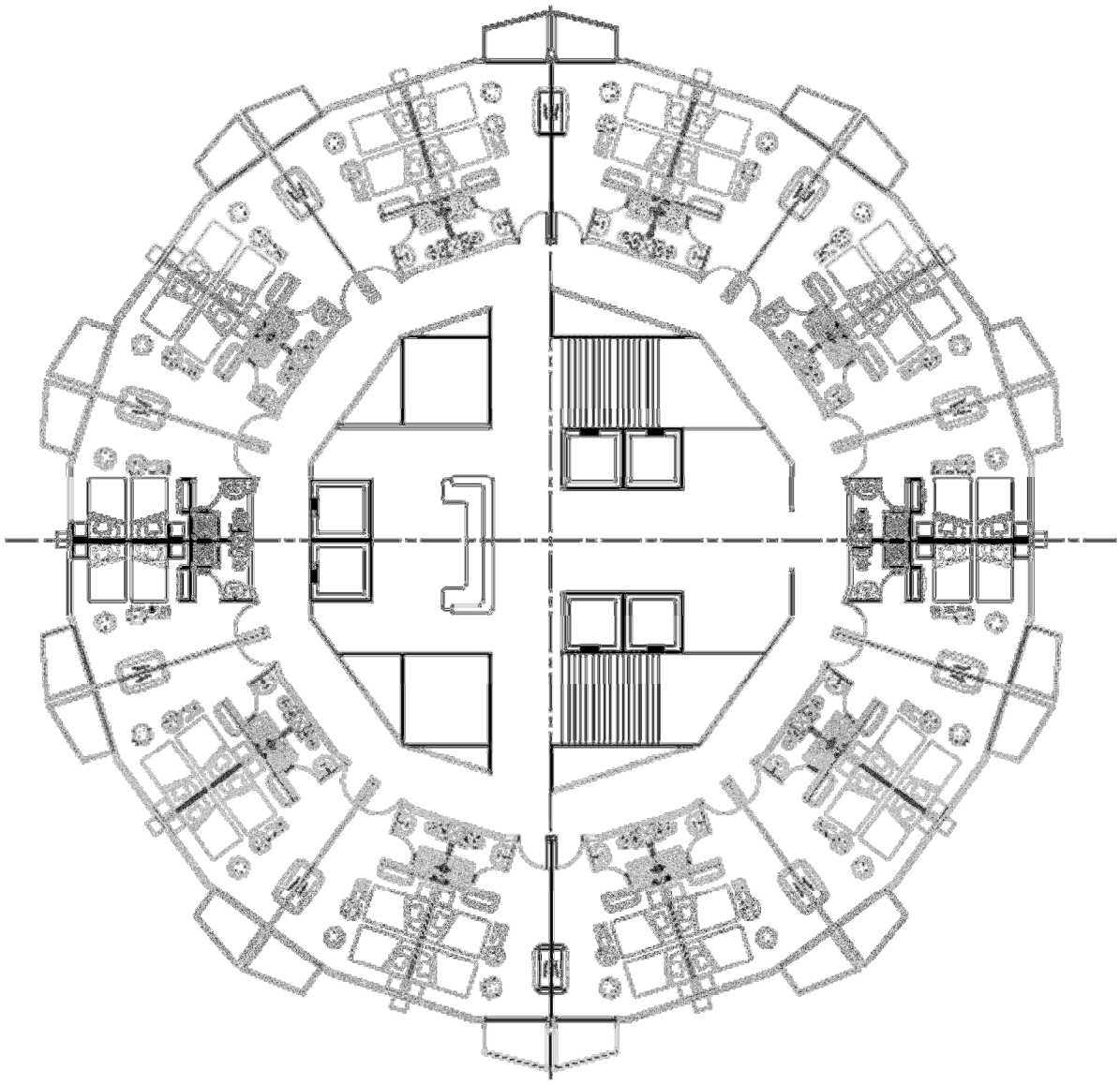

Figure 2: Typical Floor for Guest Rooms (starting from 1st floor up to 14th Floor) (Item c)
(CAD File with Dimensions in mm is available and attached to this proposal)

Note: This appendix shall be attached to your Conceptual Design Report and submitted after plot the necessary firefighting systems.

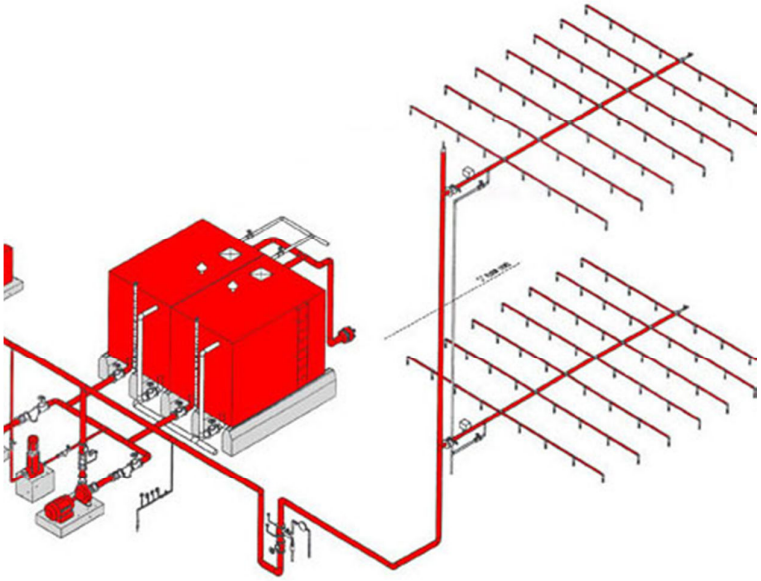

Figure 3: Sectional Elevation Diagram for NILE River Hotel Tower Building (Item d)

Note: This appendix shall be attached to your Conceptual Design Report and submitted after perform the hydraulic calculation necessary for the proposed firefighting systems.

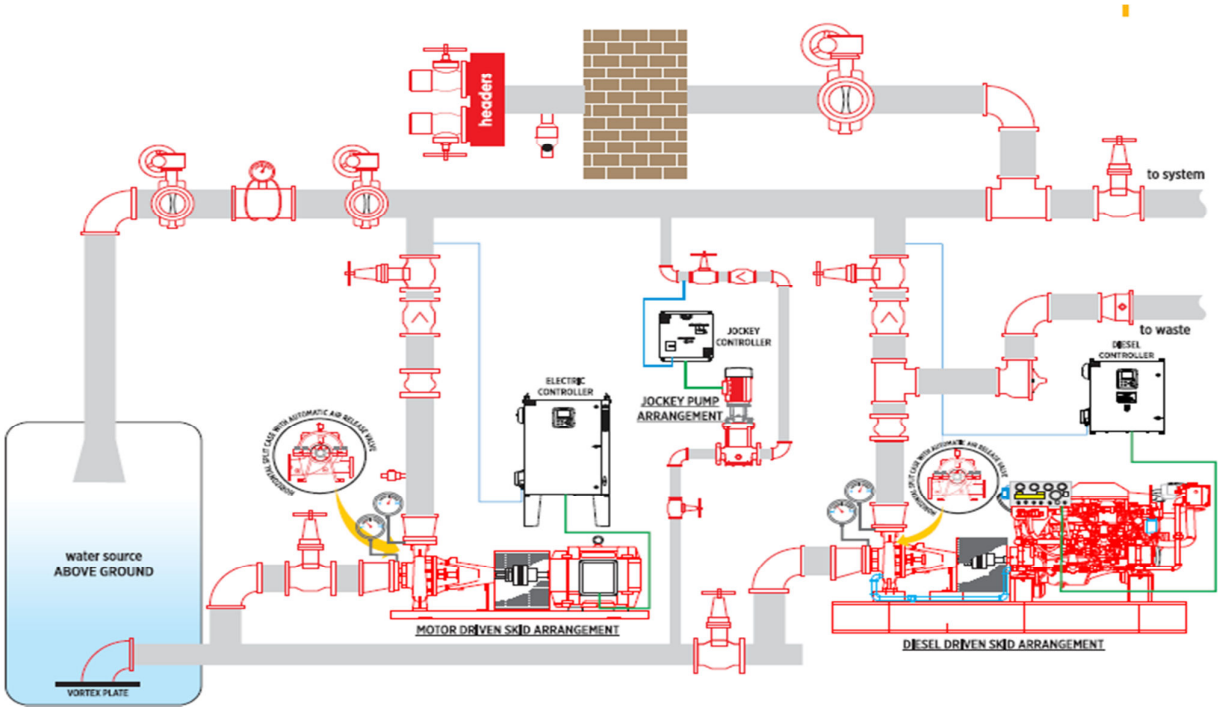

Figure 4: Sectional Elevation Diagram for NILE River Hotel Tower Building (Item e)

Note: This appendix shall be attached to your Conceptual Design Report and submitted after design the fire pump room necessary for the proposed firefighting systems.

with ***My Best Wishes***

Dr. Tarek Adel Mouneer

Appendix A
NFPA 13, Pipe Schedule for Light Hazard, and Ordinary Hazard

Table 8-5.2.2 Light Hazard Pipe Schedules

Steel		Copper	
1 in.	2 sprinklers	1 in.	2 sprinklers
1¼ in.	3 sprinklers	1¼ in.	3 sprinklers
1½ in.	5 sprinklers	1½ in.	5 sprinklers
2 in.	10 sprinklers	2 in.	12 sprinklers
2½ in.	30 sprinklers	2½ in.	40 sprinklers
3 in.	60 sprinklers	3 in.	65 sprinklers
3½ in.	100 sprinklers	3½ in.	115 sprinklers
4 in.	See Section 5-2	4 in.	See Section 5-2

For SI units, 1 in. = 25.4 mm.

Table 8-5.3.2(a) Ordinary Hazard Pipe Schedule

Steel		Copper	
1 in.	2 sprinklers	1 in.	2 sprinklers
1¼ in.	3 sprinklers	1¼ in.	3 sprinklers
1½ in.	5 sprinklers	1½ in.	5 sprinklers
2 in.	10 sprinklers	2 in.	12 sprinklers
2½ in.	20 sprinklers	2½ in.	25 sprinklers
3 in.	40 sprinklers	3 in.	45 sprinklers
3½ in.	65 sprinklers	3½ in.	75 sprinklers
4 in.	100 sprinklers	4 in.	115 sprinklers
5 in.	160 sprinklers	5 in.	180 sprinklers
6 in.	275 sprinklers	6 in.	300 sprinklers
8 in.	See Section 5-2	8 in.	See Section 5-2

For SI units, 1 in. = 25.4 mm.

Useful Equations

$$p = \frac{4.52\,Q^{1.85}}{C^{1.85}\,d^{4.87}}$$

Table 8-4.4.5 Hazen-Williams *C* Values

Pipe or Tube	*C* Value*
Unlined cast or ductile iron	100
Black steel (dry systems including preaction)	100
Black steel (wet systems including deluge)	120
Galvanized (all)	120
Plastic (listed) all	150
Cement-lined cast or ductile iron	140
Copper tube or stainless steel	150
Asbestos cement	140
Concrete	140

*The authority having jurisdiction is permitted to consider other *C* values.

Request for Research
on Fire Fighting Systems

1- A Typical **Mall building** consists of 2 basements (**B1+B2**), Ground Floor (**G**), two Typical Floors (**1st + 2nd**), and the roof, as shown in **Figure 1.** Each of the Typical Floor (G,1st, and 2nd Floors) consists of 120 Typical shops each of Length (L) of 5 m and width (W) of 5 m. The corridors are double loaded with shops, and each corridor width is 10 m, as can be seen in **Figure 2.** These Shops are numbered by including the floor number plus numbers from 01 to 120. The floor contains four elevator lobbies, service corridors, IT rooms, and MDB rooms. The fire water tank and pump room will be located in 2nd basement floor (**B2**), as can be seen on Figure 1. Each Student is requested to Prepare his/her **Conceptual Design Report for the firefighting works for this Mall building** in not more than 10 pages, including the **hydraulic calculations for automatic water sprinkler system** to protect the highest floor (2nd floor) and to **include the following items, calculations and diagrams/drawings**:

a) ***Select, Specify*** and ***List*** in a table the **proposed firefighting system(s)** and their system components for all the specified spaces inside all floors of the Mall building***, in Tabulated Format.***

b) ***Plot*** a **schematic drawing** for the proposed **Riser Diagram** for **Fire Fighting system(s)** on the attached building Sectional Elevation presented in **Figure 1**, using water based system consists of **Fire Pumping Set (or Two Fire Pumping Sets)** (**FP**s), Fire water Tank (**FWTs**) with specified water storage capacity, (**automatic water sprinklers** (**SP**s), **Fire Hose Cabinets** (**FHC**s). Use CAD file Or manual drawings to indicate the using of One Fire Fighting pumping system, as per **NFPA13** requirements.

c) ***Design*** and ***Plot*** a **schematic drawing** for the proposed automatic water sprinklers system and Fire Hose Cabinets system for the 2nd floor, which its architecture plan view is double loaded corridors as presented in **Figure 2**, as the hydraulically most remote floor, taking into consideration that that proposed sprinkler distribution could be used for all typical floors, using **concealed pendant sprinklers (Ceiling mounted) for shops and corridors** which are with reflected ceilings, as per **NFPA13** requirements.

d) ***Calculate*** the **water Demand required** and **pump head** to provide the automatic water sprinkler system and the Fire Hose Cabinets system proposed in the above item, based on the diagram shown **Figure 3** for Fire Pumps Room connected to the Fire Stand pipe(s) and Riser(s) to serve the Mall building under consideration, as per **NFPA13 & NFPA20** requirements.

e) ***Design and Redraw*** a **schematic drawing** shown in **Figure 4** for **Fire Pumps Room located beside Fire Water Tank,** as per **NFPA20** requirements, respectively.

You are allowed to use CAD files or manual drawings to be attached to your Conceptual Design report for all the above items (from a to e).

Roof Garden + Elevators Machine Room

Roof Annex …….. Roof Annex

Shops + Food Court + Main Kitchen

2nd floor …….. 2nd floor

Shops + Food Court+ Main Kitchen

1st floor …….. 1st floor

Shops + Banks Zone

Ground floor …….. Ground floor

Hyper Market + Electrical rooms + MDBs room

Basement 1 …….. Basement 1

Car Park + Fire Pump Room & Water Tanks+ Transformers & Diesel Generating Set

Basement 2 …….. Basement 2

Figure 1: Sectional Elevation Diagram for New Cairo Mall Building (Item a, b)

Note: This appendix shall be attached to your Conceptual Design Report and submitted after plot the necessary firefighting systems.

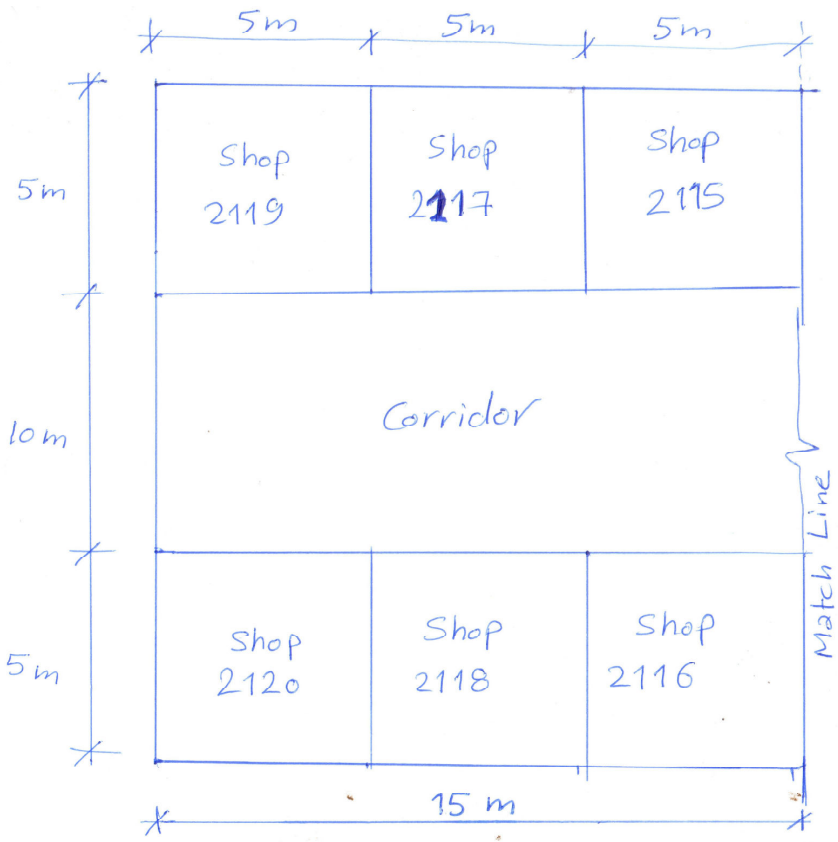

Figure 2: Most Remote Zone of Second Floor (Typical Floor) for Six Shops and the service corrodor, in New Cairo Mall Building (starting from Ground floor up to 2nd Floor) (Item c) (CAD File is not available and to be prepared by students in mm and to be attached to their reports to be submitted or to be submitted manually)

Note: This appendix shall be attached to your Conceptual Design Report and submitted after plot the necessary firefighting systems.

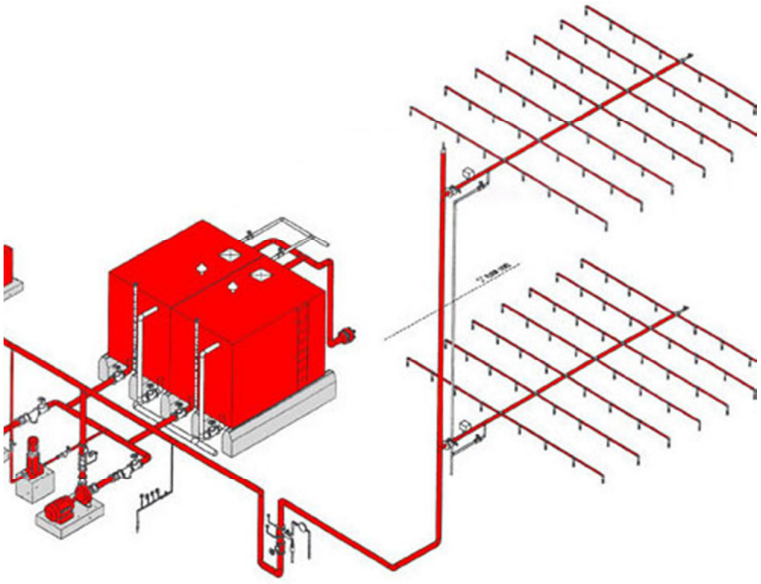

Figure 3: Sectional Elevation Diagram for New Cairo Mall Building (Item d)

Note: This appendix shall be attached to your Conceptual Design Report and submitted after perform the hydraulic calculation necessary for the proposed firefighting systems.

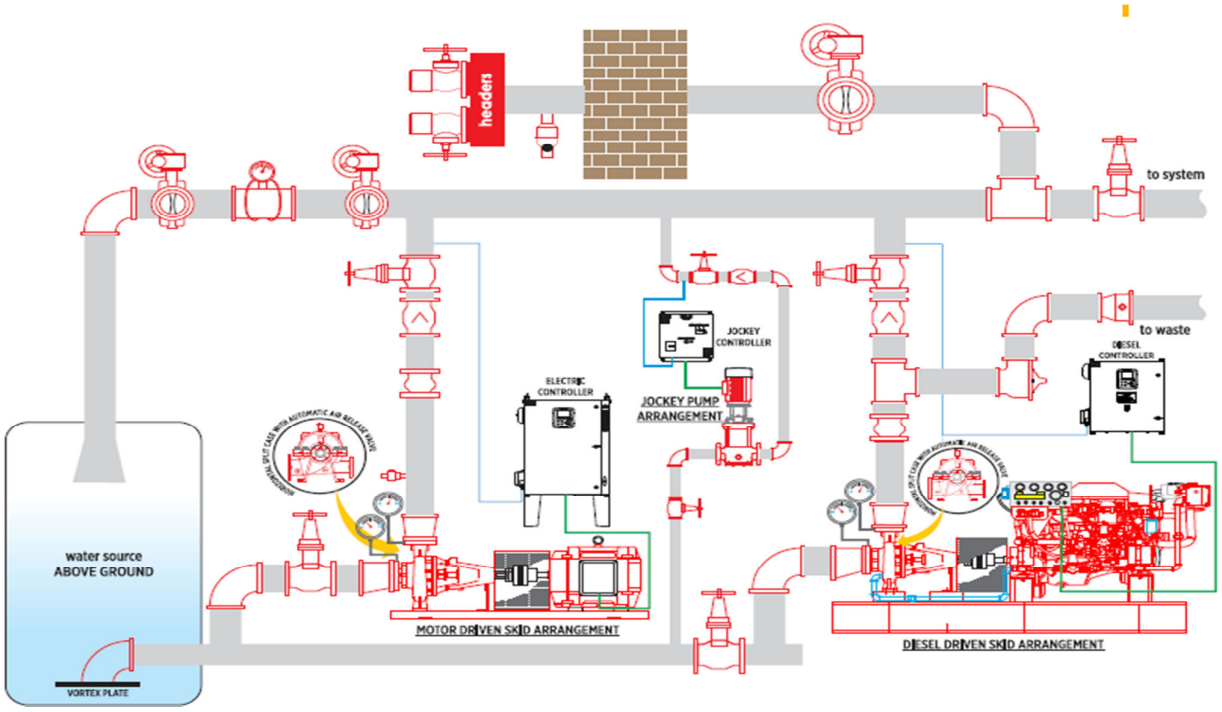

Figure 4: Sectional Elevation Diagram for New Cairo Mall Building (Item e)

Note: This appendix shall be attached to your Conceptual Design Report and submitted after design the fire pump room necessary for the proposed firefighting systems.

with ***My Best Wishes***

Dr. Tarek Adel Mouneer

Appendix A
NFPA 13, Pipe Schedule for Light Hazard, and Ordinary Hazard

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