

7 WTC

LIFE SAFETY ENHANCEMENTS

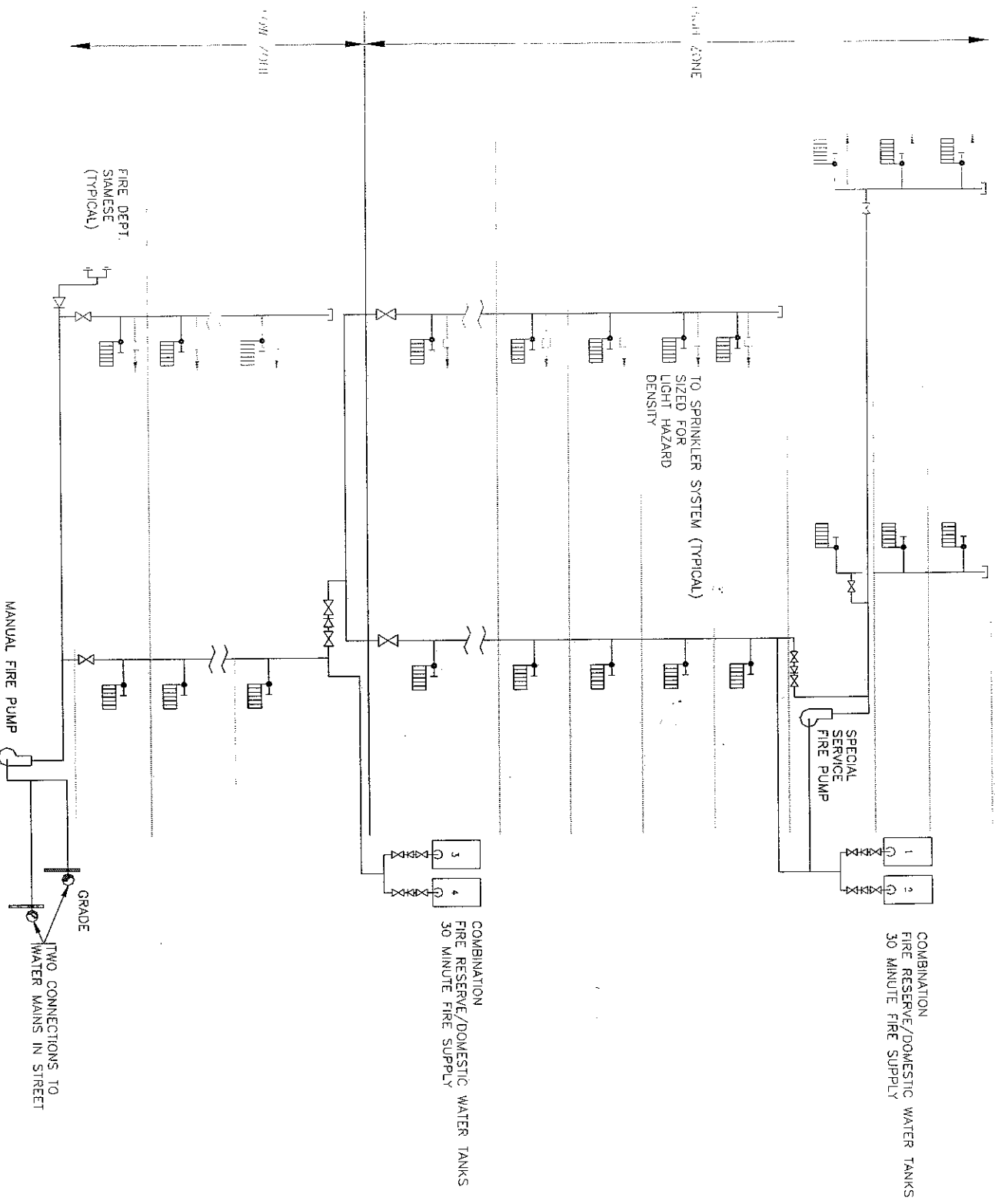
PRESENTED BY:

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CONSULTING ENGINEERS
July 26, 2004**

Introduction

- As a result of the events of 9/11, certain enhancements to the Life Safety System have been proposed and accepted by Silverstein Properties, Inc. (SPI) and the Port Authority of New York and New Jersey (PA). These enhancements address the deficiencies noted in the NIST June, 2004 Report titled: Progress Report on the Federal Building and Fire Safety Investigation of the WTC Disaster regarding the fixed fire protection system. The enhancements for the fire standpipe and sprinkler system include the following:

Typical NYC Combination Fire Standpipe / Sprinkler System Riser Diagram



Life Safety Enhancement 1

1. Size the sprinkler piping to meet an Ordinary Hazard design density for all office areas and other light hazard occupancies, providing more water on the fire. **(NIST recommendation – “select appropriate design basis fire scenarios for performance based design of the sprinkler system.”)**

Life Safety Enhancement 2

2. Increase the required fire reserve capacity within each fire reserve tank to 60 minutes in lieu of the Code required 30 minutes supply for an office building.

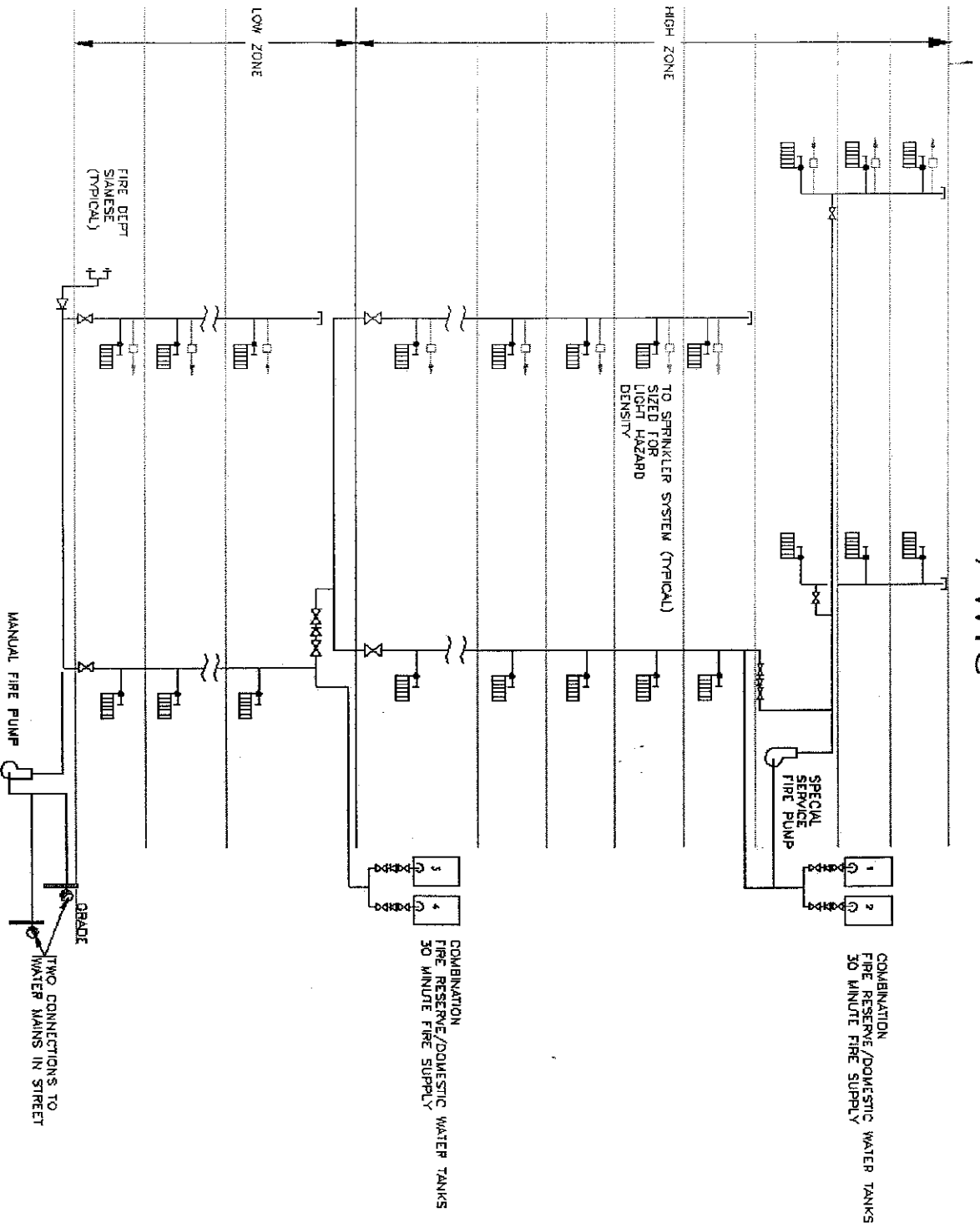
Life Safety Enhancement 3

3. Provide a fire reserve suction tank with a 60 minute supply to serve the manual fire pump. This provides an on-site captive water supply in the event that the municipal water system is disrupted.

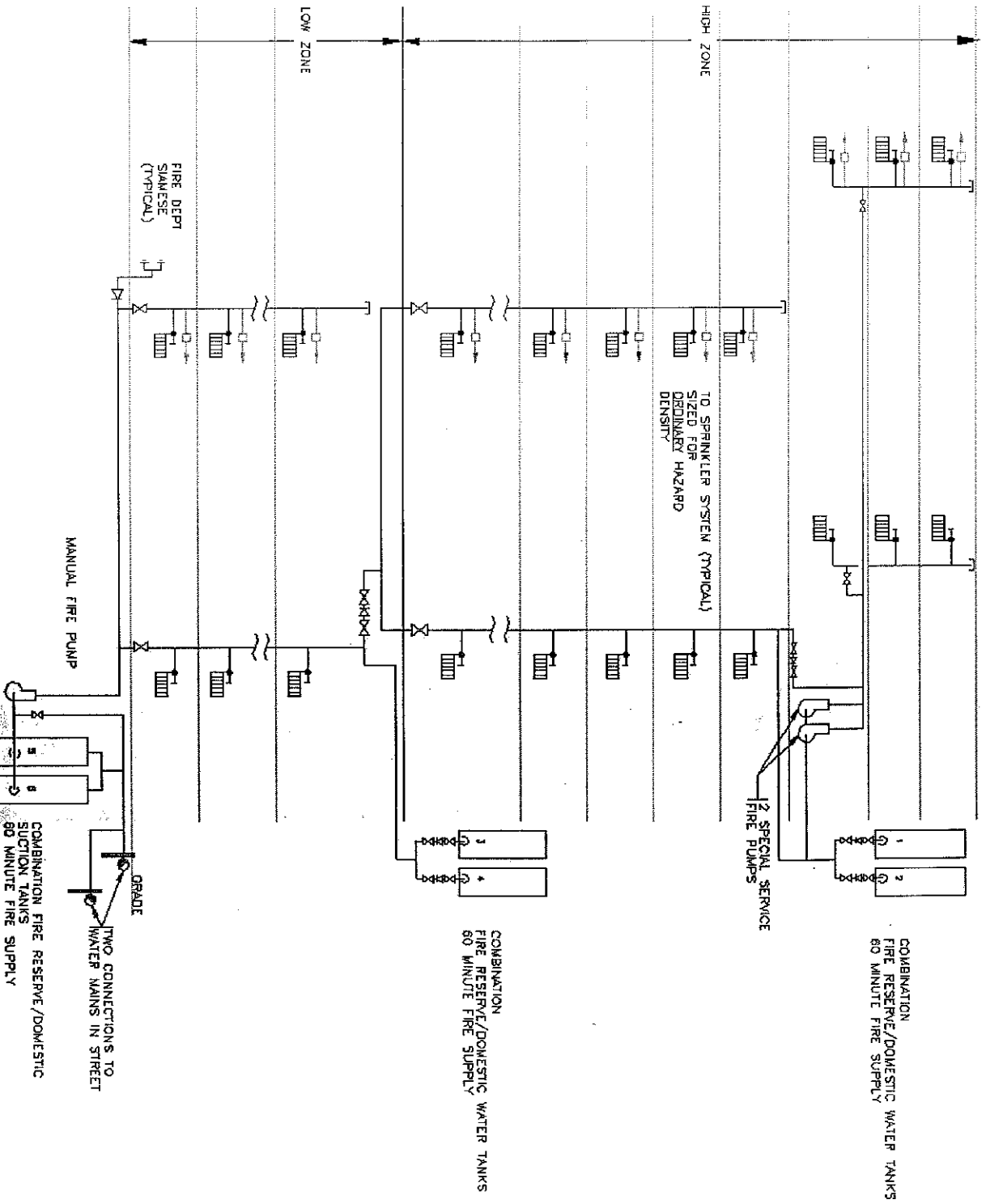
Life Safety Enhancement 4

4. Provide a redundant special service fire pump for the upper levels of the high zone.

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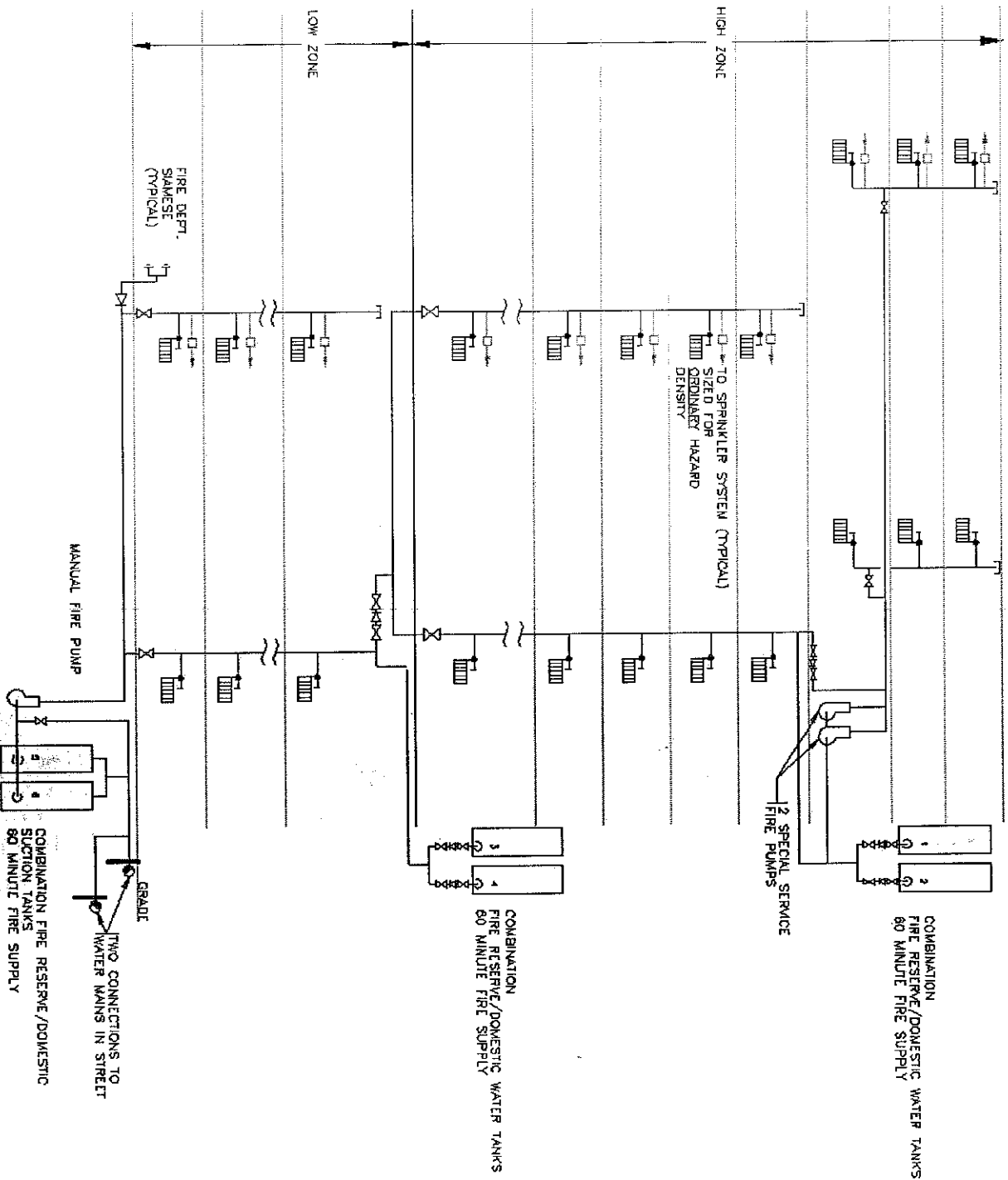
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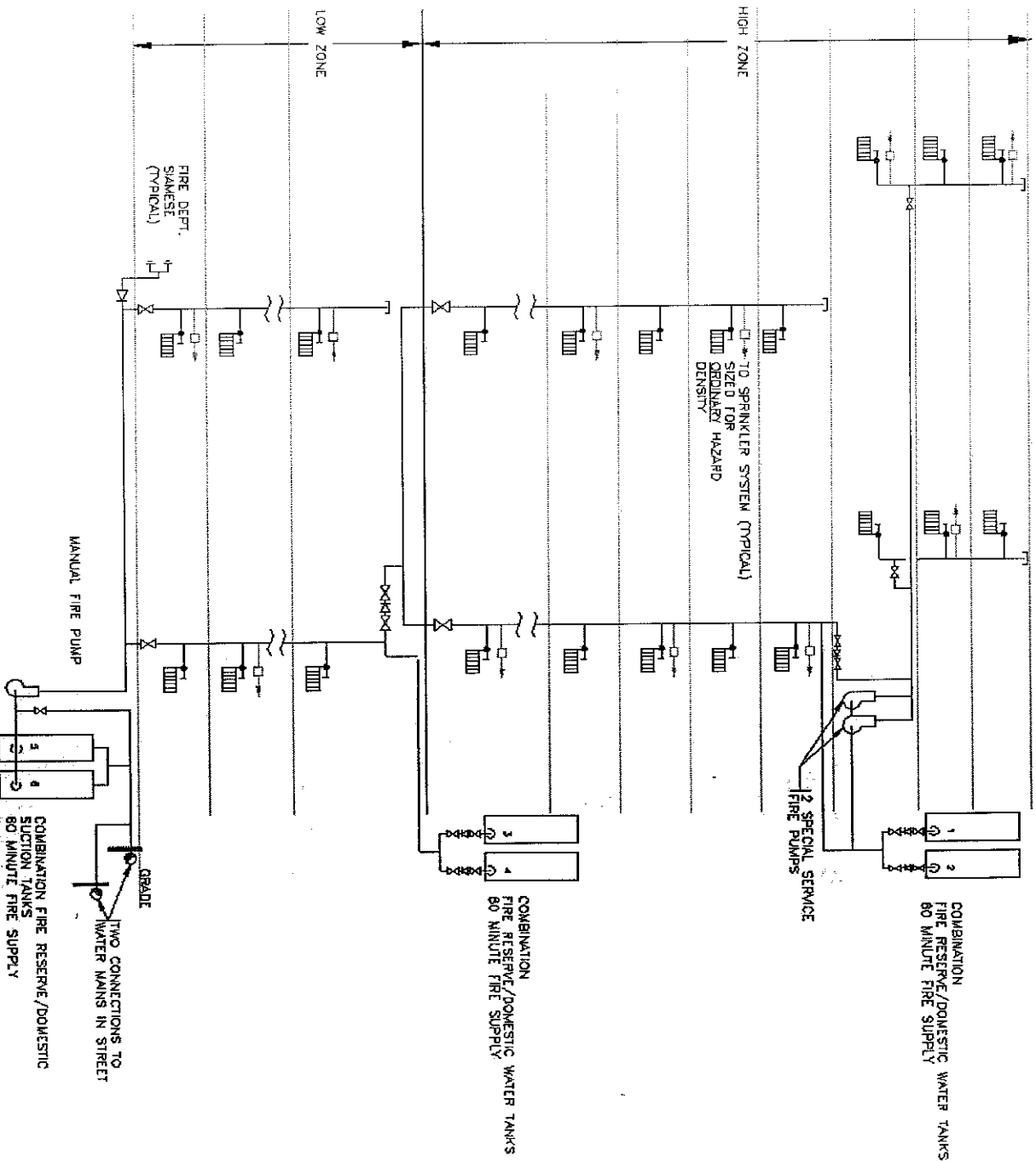
Life Safety Enhancement 5

5. Sprinklers throughout the building are to be supplied from two standpipes, one located in each hardened stair, with each riser serving sprinklers on alternate floors. Therefore, if any one riser was compromised, an affected floor would be “sandwiched” between two floors with sprinkler supply from the non-affected standpipe. **(Eliminates single point of failure on the sprinkler system.)**

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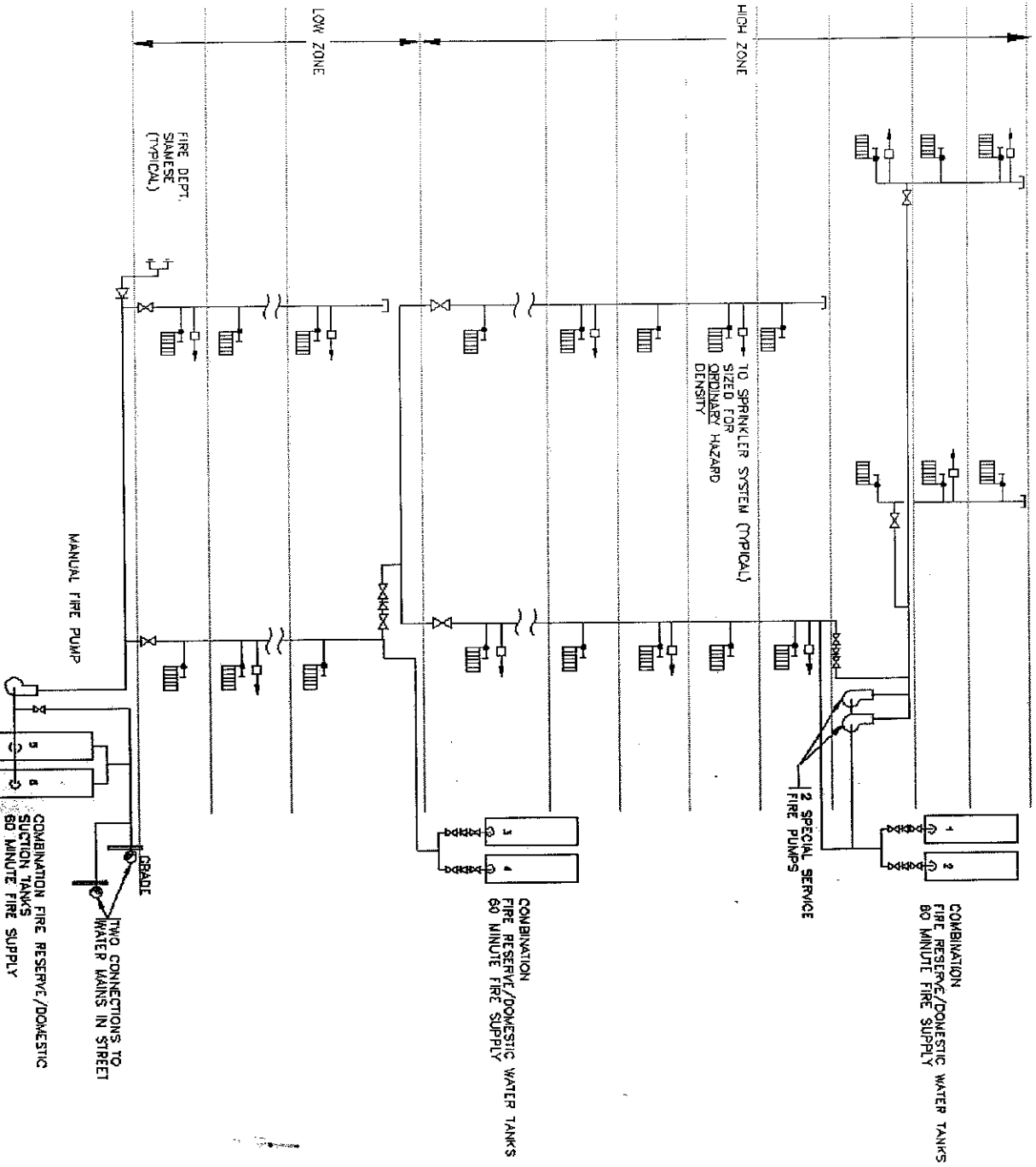
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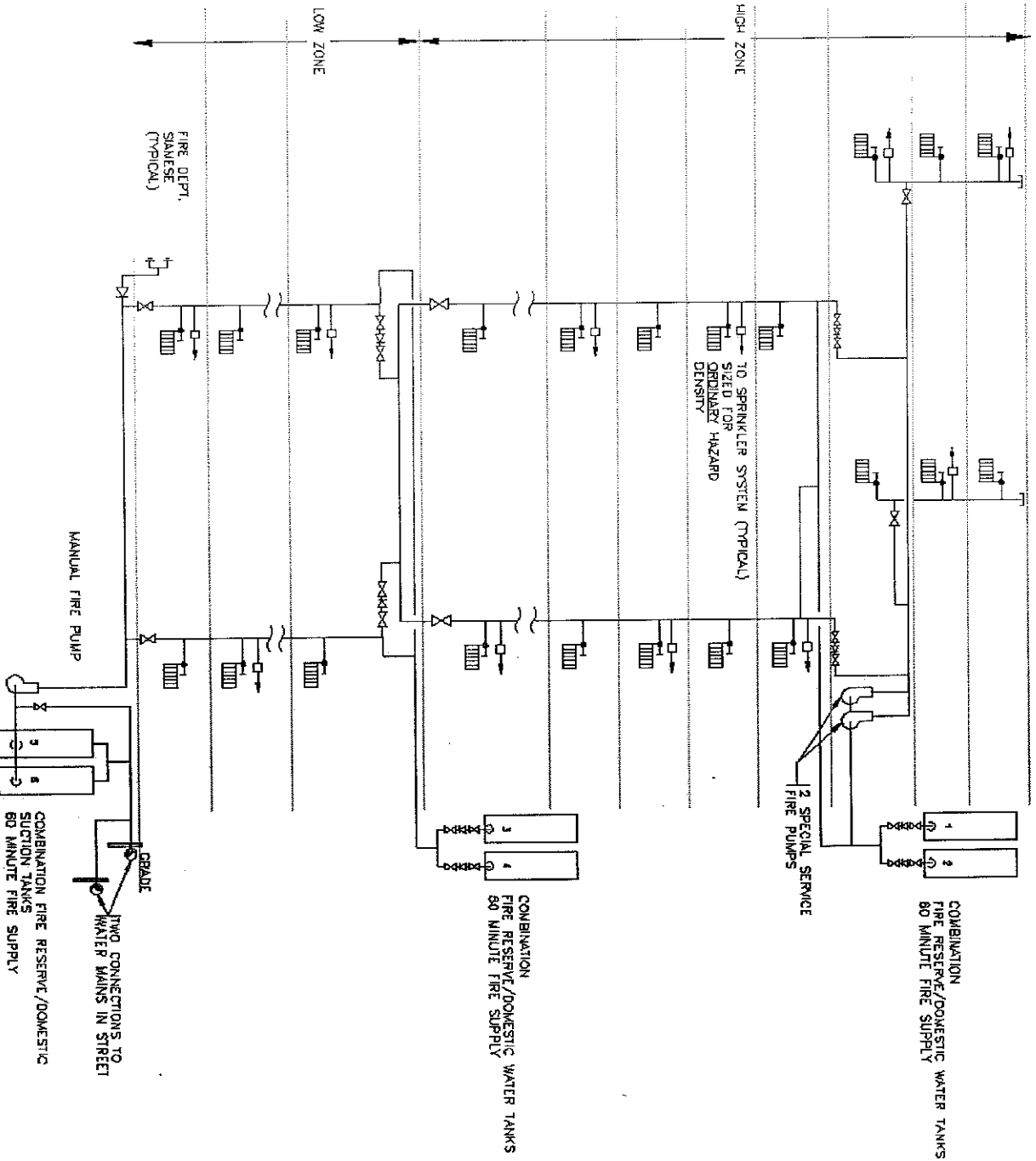
Life Safety Enhancement 6

6. All fire standpipes are to be connected at the top and bottom of each zone, thus allowing both low zone standpipes to connect to the high zone and water to be supplied from either the combination domestic water/fire reserve tank or the fire pump to both risers directly from the cross-connection at the top and bottom respectively. The NYC Building Code requires only one standpipe to connect between each zone thus requiring the fire reserve tank water supply to travel down one riser and back up the second. Therefore, if that standpipe is out of service for any reason, then the system is compromised. **(Eliminates single point of failure on the sprinkler system.)**

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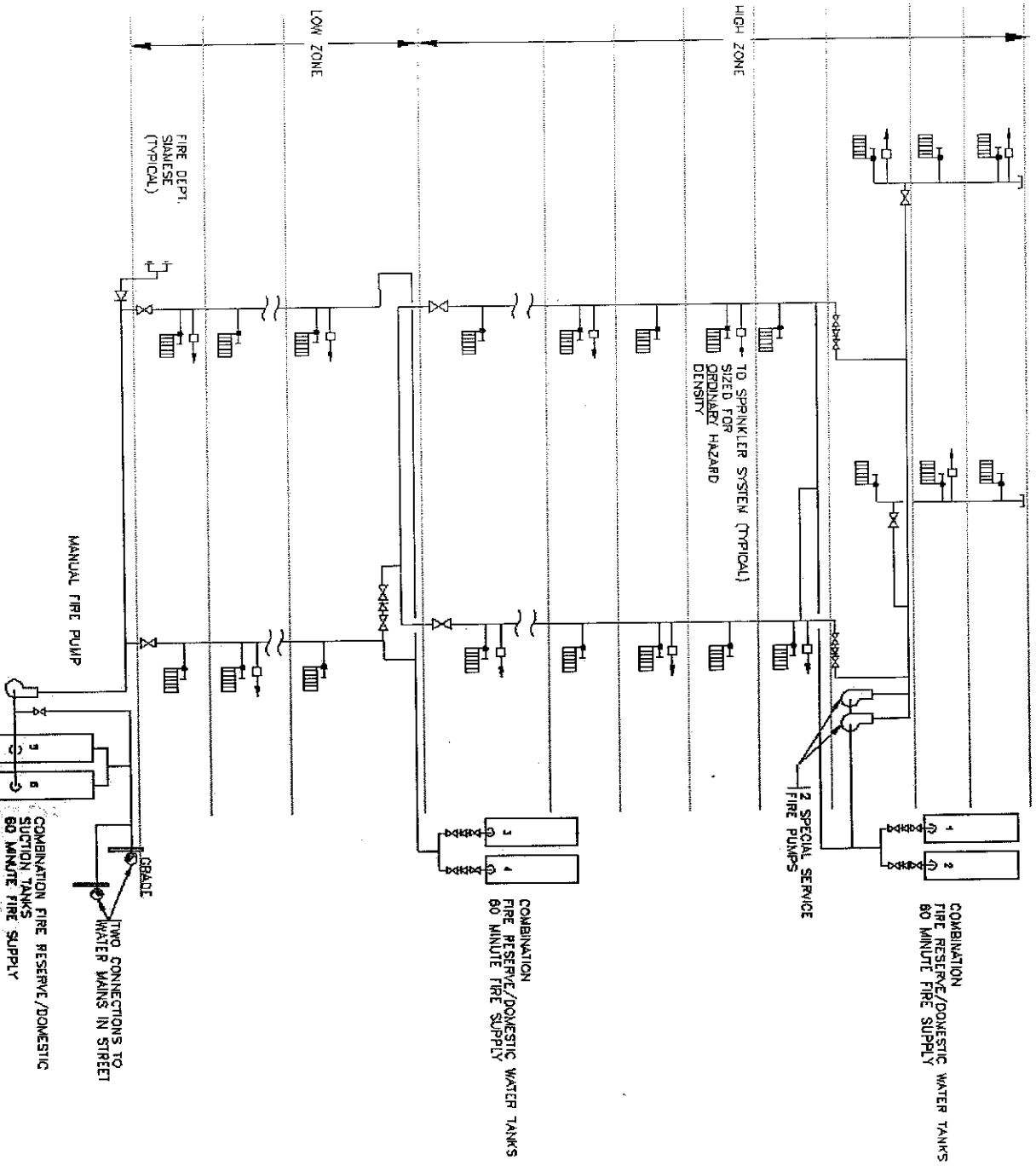
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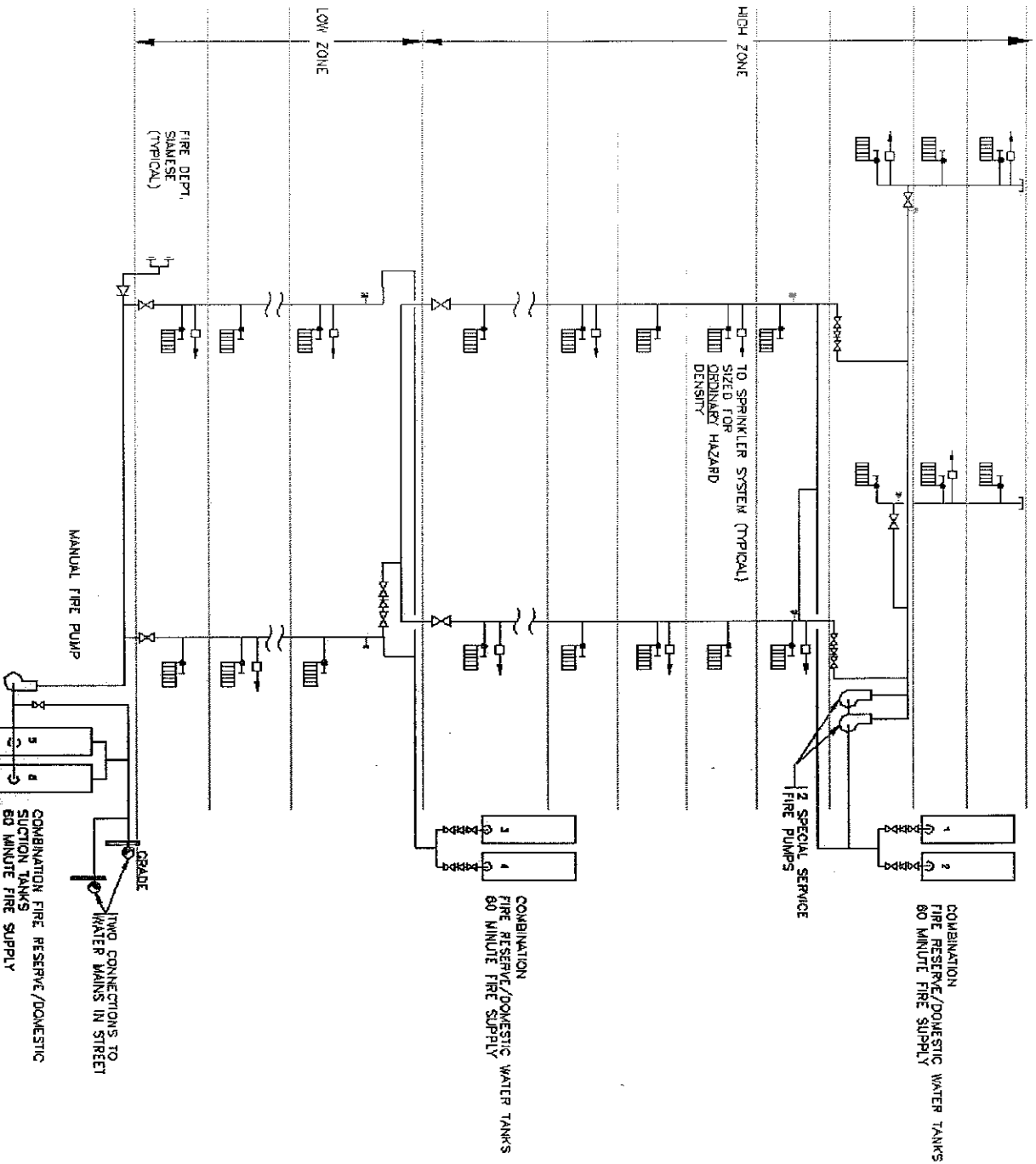
Life Safety Enhancement 7

7. The provision of water flow indicators at the top of each standpipe to indicate water flow in the standpipe. Therefore, if a hose valve is opened or a riser is broken the building would be alerted to the water flow condition in the individual standpipe.

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Life Safety Enhancement 8

8. Installation of Automatic Breach Control Valves (ABCV's) at the top of each standpipe to isolate the standpipe in the event of a sudden rupture of a standpipe, thus preserving the remaining storage volume at the top of the building for use through the remaining standpipe, and allowing the Fire Department additional time for staging.

The purpose of this presentation is to discuss the installation of the recommended Automatic Breach Control Valves (ABCV).

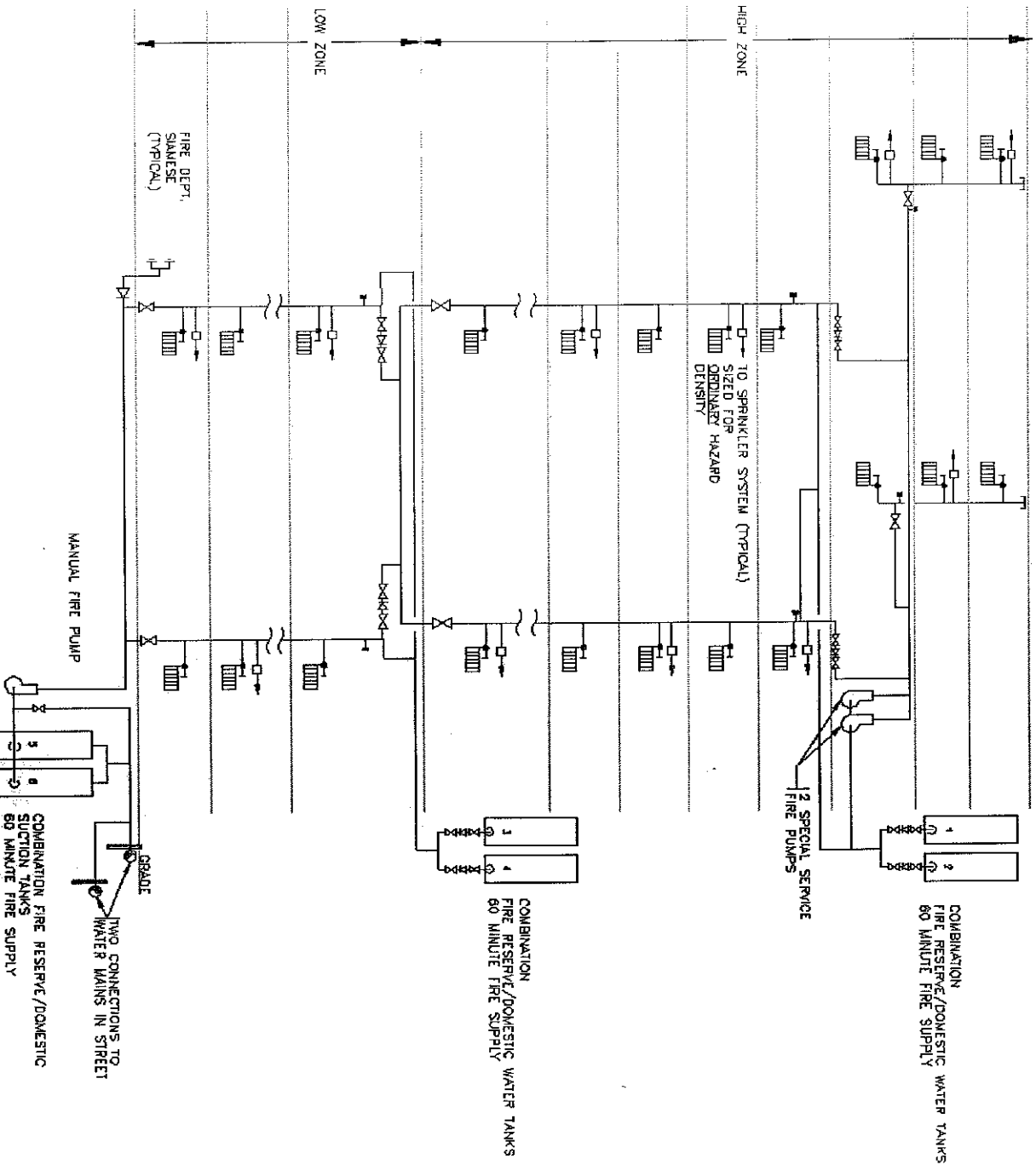
Background

- During the 9/11 disaster, as a result of the planes striking the towers, it has been reported that at least one or more of the standpipes within the building were severed. As a result, the standpipe/sprinkler systems in the towers were rendered useless. The fire reserve was lost and the NYFD could not pump up the standpipes since the pipes were open ended.

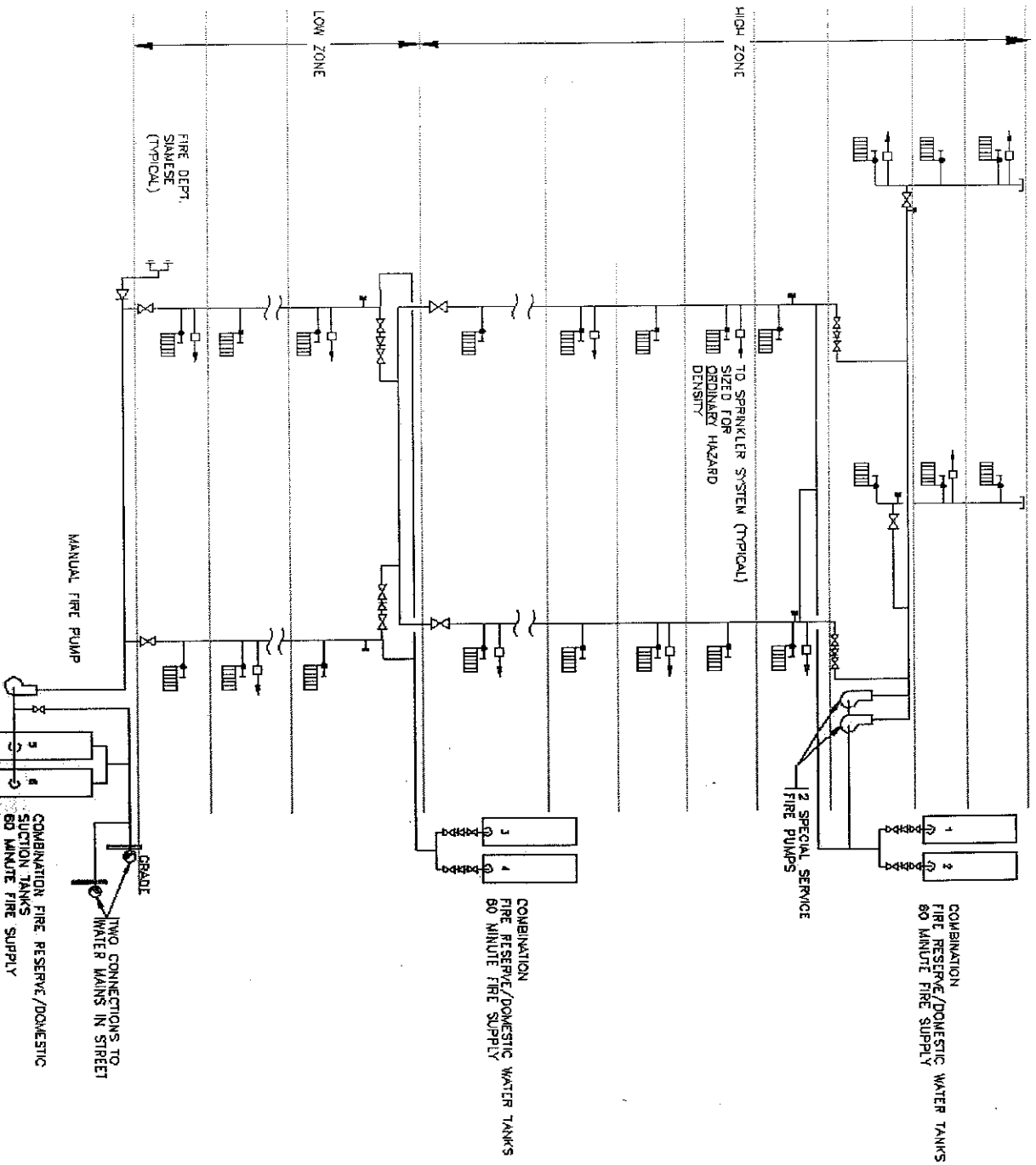
- The NIST June 2004 progress report on the Federal Building and Fire Safety investigation of the WTC disaster states

“Although the fire sprinkler system was damaged by aircraft impact, the water supply riser system lacked redundancy and there existed the potential for single point failure of the water supply connection on each floor.”

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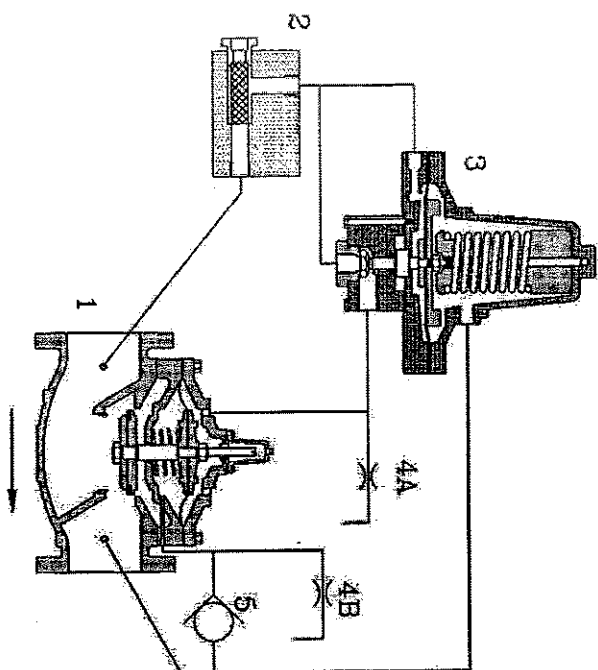


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Automatic Breach Control Valve - ABCV

- Self-Contained Valve Option (Automatic Breach Control Valve – ABCV): This valve consists of a main control valve and a smaller pilot control valve assembly (see attached diagram). The main valve is a normally open valve. A control line is taken from the inlet side of the main valve through a strainer to the underside of a diaphragm of a pilot control valve. This force would tend to try to open the pilot valve. This valve is normally held closed. A control line is taken from the downstream side of the main valve and is connected to the top side of the pilot control valve diaphragm. The combination of this pressure and a spring is keeping the valve closed. If the downstream pressure falls off to a very low value (signifying a greater than anticipated flow), the pressure on the diaphragm is not sufficient to counteract the pressure below the pilot valve diaphragm, thus allowing this valve to open. As the valve opens, a control line brings the water pressure to the top of the main valve diaphragm, causing the main valve to close. In the event of a malfunction, e.g., a diaphragm rupture, the valve will fail open. The spring is made of stainless steel 303 and is not envisioned to fail, as the spring is not fatigued (subject to movement). However, in the event the valve closed erroneously, the Fire Department operation is not hindered, as the system can still be supplied from the fire pump or the Fire Department siamese connections, including the affected riser as well as the zones above the affected riser. Test gauges will be provided at the valves to monitor valve operation during test conditions.



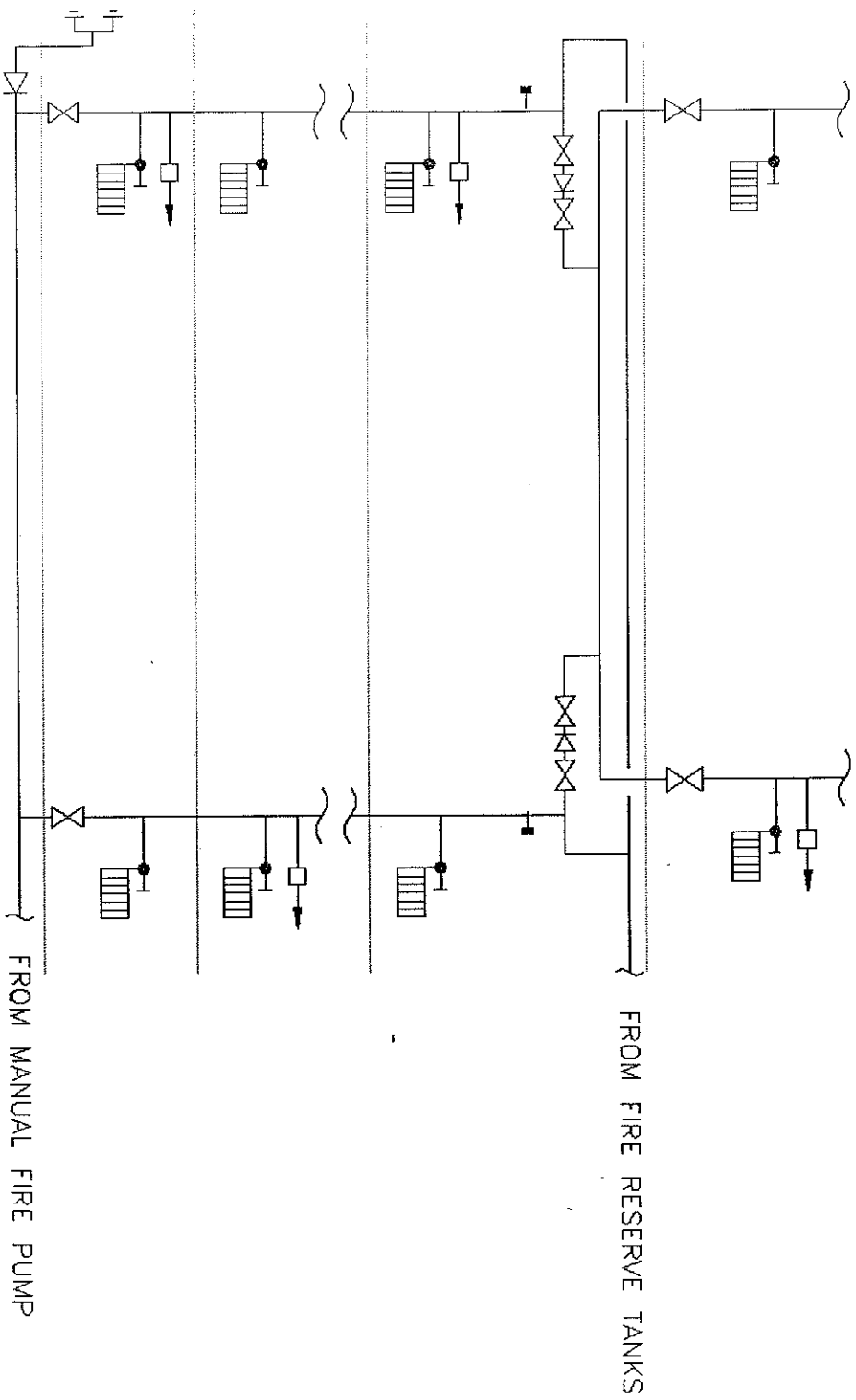
- 1. Main Valve.
- 2. Strainer.
- 3. Normally Closed Pilot.
- 4. Fixed Restriction - 1/16".
- 5. Check Valve.

Automatic Breach Control Valve

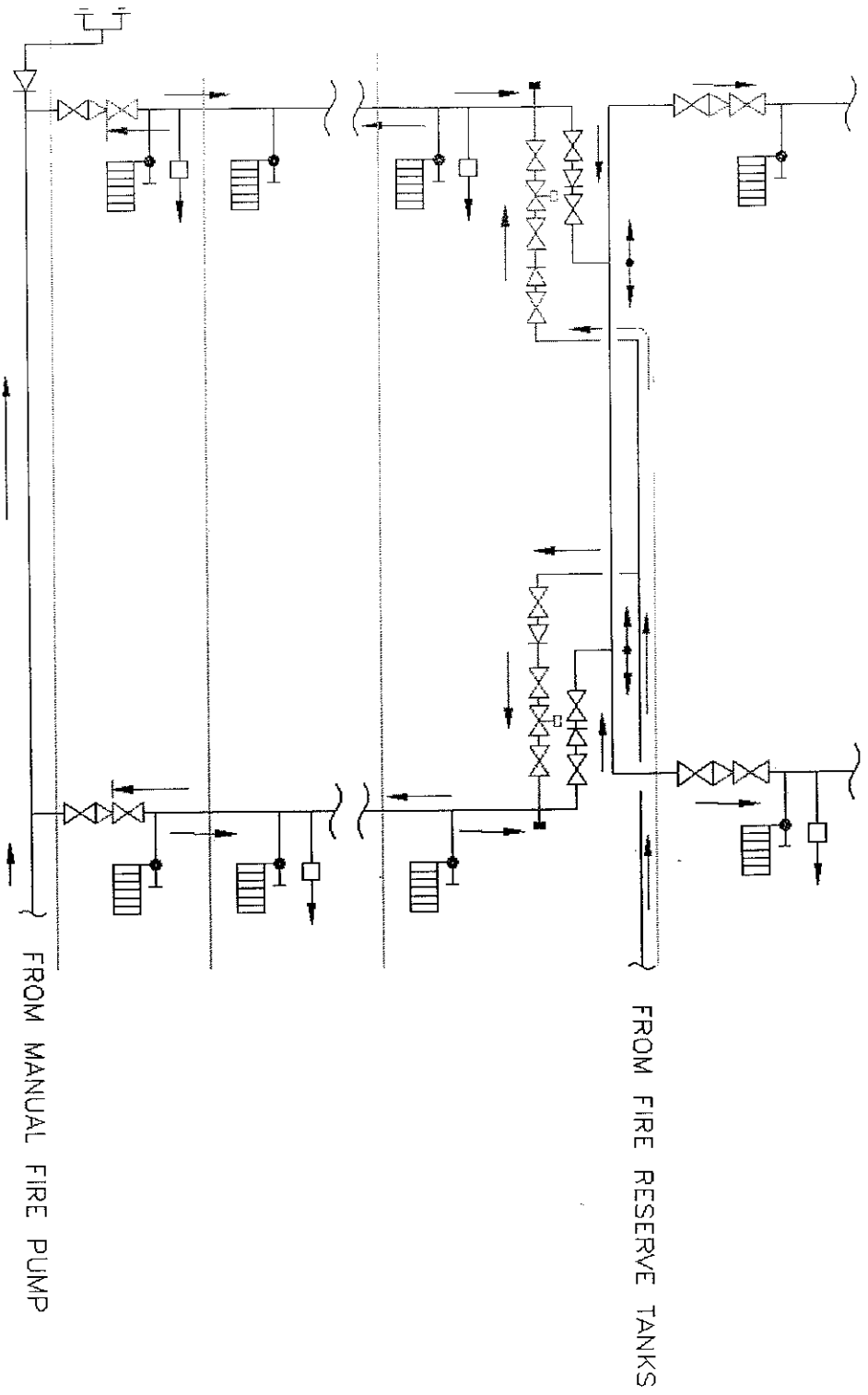
Automatic Breach Control Valve - ABCV

- The ABCV valve is manufactured by Cla-Val Company and the Singer Valve Company. While the main valve as manufactured by Cla-Val has UL listings for use as fire pump relief valves, fire pressure-reducing valves and pump suction control valves, the ABCV's as an assembly are not currently UL listed or Factory Mutual (FM) approved.

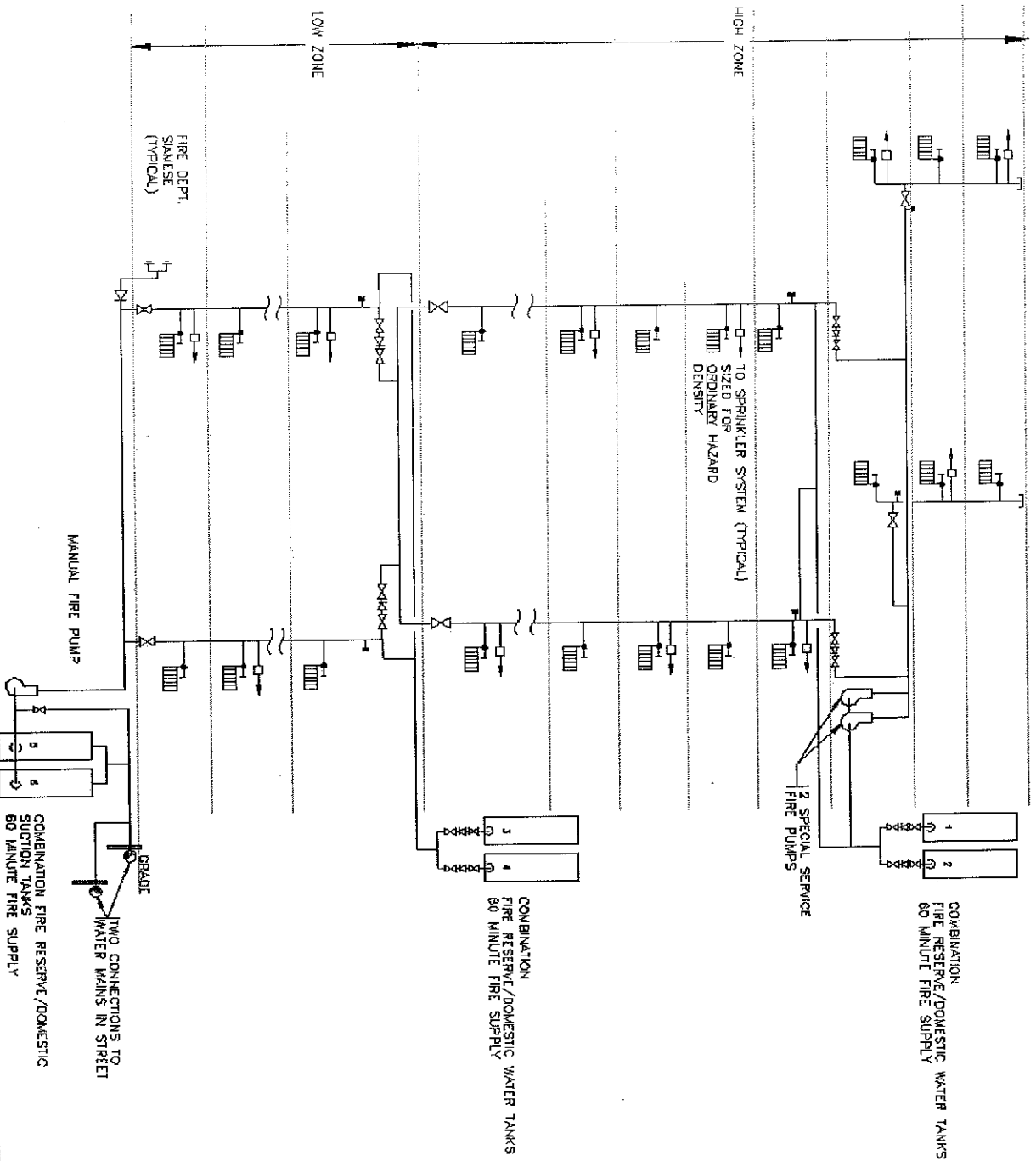
7 WTC ABCV Installation Detail



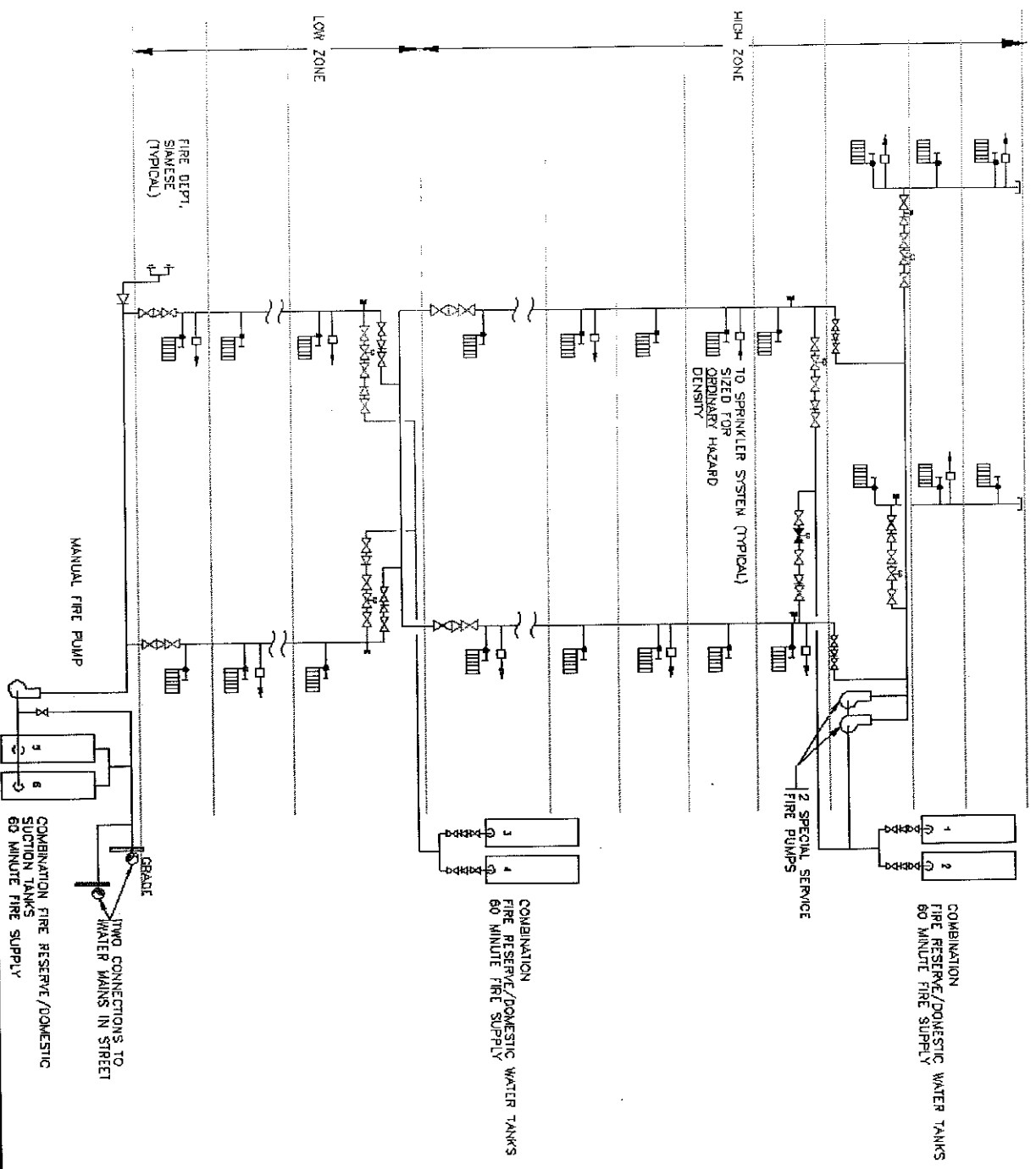
7 WTC ABCV Installation Detail



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Recommendation

We recommend the use of the “Self-contained Valve Option” (ABCV).
on the basis of the following:

- The valve is fail-safe, i.e., in the event of failure, the valve fails open. Thus, if failure were to occur, it is as if the valve were not there.
- If the valve were to close unintentionally (highly unlikely), it does not compromise the ability of the Fire Department to fight the fire – the system can still be pressurized utilizing the fire pump or the siamese connections.
- The valve is self-contained and does not rely on external power sources for operation.
- If this ABCV is not provided, in the event of a rupture of the standpipe, the entire zone of the building served by the ruptured standpipe would be without sprinkler protection until the Fire Department arrived at the scene. Once the Fire Department arrives, they would have to send personnel to the base of the affected riser and above the fire floor to shut off the control valves at the top of the affected standpipe in order to isolate the standpipe before they could pressurize the remaining standpipe system.