8.10.6 Testing of alarm devices Alarm devices shall be tested through a 15 mm test valve located on the installation side of the alarm valve. Installations on the alternate wet and dry system using both wet and dry alarm valves shall have testing valves fixed both above the dry alarm valve (for use when the installation is under water pressure) and between the wet and dry alarm valves (for use when the installation is under air pressure). (See AS 1851.3, for test procedure.)

8.11 REMOTE TEST VALVES For the purpose of the commissioning and periodic testing, a remote test valve shall be provided on each installation (see Figure 8.1).

The remote test valve piping shall not be less than 25 mm nominal diameter and shall be taken from the end of a range pipe in the most remote group of sprinklers on the installation.

Where the most remote group of sprinklers is not the highest in the installation, an additional remote test valve shall be connected to the range pipe at the highest level.

The test pipe shall terminate in a smooth bore, corrosion resistant orifice giving a flow equivalent to the smallest orifice sprinkler representative of the installation.

The remote test valve shall be readily accessible, locked shut, and labelled-

'Sprinkler Remote Test Valve-To be locked shut'.



FIGURE 8.1 TYPICAL REMOTE TEST VALVE

Maximum scale	Maximum
reading	graduation interval
MPA	kPa
1.0	20
1.6	50
>1.6	100

8.12 PRESSURE GAUGES Pressure gauges shall comply with the requirements of AS 1349 and shall have scales with graduations as follows:

NOTE: The maximum scale value of gauges should be approximately 150 percent of the known maximum pressure.

Means shall be provided to enable each pressure gauge to be readily removed without interruption to installation water supplies.

Gauges to monitor pressures shall be installed in the system at the following locations:

- (a) Immediately above the alarm valve.
- (b) Adjacent to the main stop valve, connected to indicate the pressure of each water supply. The connection for such gauges shall be on the supply side of the non-return valve nearest the supply.

NOTE: For multiple installation systems, each subsequent main stop valve, or group of main stop valves, may be fitted with a gauge indicating trunk main pressure only.

- (c) On the delivery side of all pumps.
- (d) On the suction side of all pumps.
- (e) On all pressure tanks (see Clause 4.13).

SECTION 9 LIGHT HAZARD CLASS SYSTEMS

9.1 DESIGN DATA Light hazard systems shall be hydraulically designed to provide an appropriate density of discharge over an assumed area of operation (number of sprinklers likely to operate) in all areas of the protected building as follows:

The design density of discharge and the assumed area of operation shall be as follows:

(a) Design density of discharge 2.25 mm/min.

In certain areas of light hazard, the density shall be increased by closer spacing of sprinklers (see Clause 9.3.1).

9.2 WATER SUPPLIES

9.2.1 Pressure and flow requirements The water supply shall provide at the installation control assemblies a minimum running pressure, measured on the installation gauge immediately above the alarm valve, of—

- (a) 220 kPa plus the pressure equivalent of the difference in height between the control assemblies and the highest sprinkler when water is being discharged through the control assemblies at a rate of 225 L/min; and
- (b) at least 170 kPa plus the pressure equivalent of the difference in height between the highest sprinkler and the control assemblies when the flow is increased to 400 L/min. (See Clause 4.5.)

9.2.2 Minimum capacity of water supplies

9.2.2.1 Town main A town main supply shall be fed from a source of at least 1 ML capacity.

NOTE: A source of smaller capacity may be approved if full particulars are submitted to the regulatory authority.

TABLE 9.2.2.2

WATER STORAGE CAPACITY FOR LIGHT HAZARD CLASS SYSTEMS

Maximum height of sprinkler above lowest sprinkler	Minimum capacity*†
m	L
15	21 000
30	25 000
45	28 000
60	31 000
75	33 000

* Where the system is divided into various pressure stages, as required by Clause 4.6, the tank capacity may be based on the maximum stage height, rather than on the total height of the building. Where the total building height exceeds 75 m, the capacities given are to be increased by one-third for each additional 75 m or part thereof.

[†] In fully hydraulically calculated light hazard systems, the water requirement is the maximum calculated demand in litres per minute for the hydraulically most favourable area for a period of 30 min. See Section 12.

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9.2.2.2 Reservoirs and tanks other than pressure tanks The minimum capacities shall be as specified in Table 9.2.2.2. These capacities relate to stored water entirely reserved for the sprinkler system (including fire hose reels). For pump suction tanks, these capacities may be reduced in accordance with Clause 9.2.2.3, but the maximum period of inflow shall be 30 min.

9.2.2.3 *Pump suction tanks* Pump suction tanks shall have an effective capacity reserved entirely for the sprinkler system not less than that specified in Table 9.2.2.2. Smaller capacity, but not less than 9000 L, may be permitted, provided that automatic inflow can be relied on to enable the pump to operate at full capacity for not less than 30 min. (See also Clause 4.8.1.) Where tanks are used for a Grade 2 water supply, reference should be made to Clause 4.3.3.(c).

9.2.2.4 Supplies not reserved entirely for sprinklers Any private reservoir which also provides water for trade and domestic purposes shall contain at all times not less than 500 000 L.

9.2.2.5 *Pressure tank* The minimum quantity of water to be maintained in a pressure tank reserved entirely for sprinklers shall be as follows:

(a) Where sole supply 23 000 L.

(b) Where duplicate supply 15 000 L.

The minimum air pressure to be maintained in a pressure tank shall be determined from the appropriate formula set out in Clause 4.13 and shall be not less than 190 kPa plus the pressure loss in the piping, or 30 kPa, whichever is the greater. The pressure loss in the piping shall include all valves between the outlet from the pressure tank and the installation gauge, and shall be calculated at a flow rate of 400 L/min. Table 9.2.2.5 indicates the required working pressure for tanks having proportions of air of one-third, one-half and two-thirds.

TABLE 9.2.2.5

Proportion of air in tank	Minimum air pressure to be maintained in tank when base is level with highest sprinkler kPa	Add for each metre or part thereof where tank is below highest sprinkler kPa
One-third	860	30
One-half	380	15
Two-thirds	540	20

MINIMUM AIR PRESSURE IN PRESSURE TANKS

9.2.3 Pumps Pumps shall comply with the requirements of AS 2941.

9.2.4 Proving of water supplies Water supplies shall be proved in accordance with the requirements of Clause 4.14.

9.3 SPACING OF SPRINKLERS

9.3.1 Maximum area coverage per sprinkler The maximum area coverage per sprinkler shall be as follows:

(a)	Sidewall sprinklers	17 m^2 (see also Clause 5.5).
(b)	Other sprinklers	. 21 m^2 (see also Section 6).

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In certain areas of light hazard occupancies such as attics, basements, boiler rooms, kitchens, laundries, storage areas, workrooms, electronic data processing rooms, air conditioning and building services plant rooms, restaurants and cafes not exceeding 126 m^2 in area, the maximum area coverage shall be limited to 9 m^2 per sprinkler and the maximum distance between sprinklers shall be limited to 3.7 m.

9.3.2 Maximum distance between sprinklers on range pipes and between adjacent rows of sprinklers The maximum distance between sprinklers on range pipes and between adjacent rows shall be as follows:

- (a) Sidewall sprinklers along the walls 4.6 m (see also Clause 5.5).

NOTE: See also Clause 9.3.1 for reduced distances for certain occupancies.

9.3.3 Maximum distance from walls and partitions (See also Clauses 5.4.2 and 5.5.) The maximum distances of sprinklers from walls and partitions shall be as follows:

(a)	Sidewall sprinklers from end walls	 2.3 m.
(b)	Other sprinklers	 2.3 m.

9.4 SYSTEM COMPONENTS

9.4.1 Sprinklers

9.4.1.1 *Size and type* Sprinklers shall have a nominal orifice size of 10 mm and may be spray, ceiling (flush) or sidewall pattern.

9.4.1.2 Stock of replacement sprinklers A stock of spare sprinklers shall be provided. As a general guide, the minimum number of spares of standard temperature rating should be six sprinklers.

9.4.2 Piping

9.4.2.1 *Pipe sizes* Pipe sizes shall be determined partly by the pre-calculated pipe sizing table and partly by hydraulic calculation, or by full hydraulic calculation. Refer to Section 12.

Table 9.4.2.2 shall be applied only to those portions of the piping described in Clause 9.4.2.2; the remainder of the piping shall be calculated in accordance with Clause 9.4.2.3.

Figure 9.4.2.1 illustrates piping arrangements showing the various design points (3-sprinkler points) from which the piping shall be calculated hydraulically. The length of pre-calculated piping to any sprinkler downstream of the design point shall not exceed 14 m, inclusive of equivalent length allowance for elbows (see Clause 9.4.2.3). The design point shall be within this 14 m maximum permitted length and shall be taken as the sprinkler, elbow or tee in the piping, downstream of which not more than three sprinklers are located. In the determination of the appropriate diameter of the pipes in the hydraulically calculated portions of a system, apart from complying with the requirements for maximum aggregate pressure loss, pipes shall diminish in diameter only in the direction of the flow of water to any sprinkler.

9.4.2.2 *Pre-calculated piping* Piping at the extremities of light hazard class systems downstream of each design point (3-sprinkler points) shall comply with the requirements of Table 9.4.2.2.



NOTES:

- 1 Between valves and design points A-H, pressure loss not exceeding 200 kPa.
- 2 Circled dimensions—calculated. Other dimensions—from pre-calculated tables.
- 3 Pipe sizes are nominal internal diameters in millimetres.

FIGURE 9.4.2.1 TYPICAL LIGHT HAZARD CLASS SYSTEM

TABLE 9.4.2.2

MAXIMUM NUMBER OF SPRINKLERS ON PRE-CALCULATED PIPING

Nominal internal pipe size*	Maximum number of sprinklers
mm	permitted
20	1
25	3†

* The length of 20 mm pipe in any route from a sprinkler to the installation valves is not to exceed 8 m and the total length of pre-calculated pipe, both 20 mm and 25 mm, is not to exceed 14 m, inclusive of equivalent length allowance for elbows in each case.

[†] This does not preclude the use of 25 mm pipe between the design point and the installation valves if hydraulic calculation shows that this is possible.

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9.4.2.3 Hydraulic calculation of piping (partly pre-calculated systems) The size or sizes of the piping between each design point and the installation valves shall be calculated hydraulically on the basis that with a flow of 400 L/min the aggregate pressure loss due to friction does not exceed 200 kPa.

The losses given in Table 9.4.2.3 shall be used for the calculations. The loss of pressure at each elbow, bend or tee where water is turned through an angle shall be taken as that incurred through 2 m of straight pipe.

Nominal internal pipe size mm	Loss of pressure per metre length of pipe† kPa
25	56.8
32	14.8
40	7.1
50	2.27
65	0.64
80	0.29
100	0.08
150	0.012
200	0.0029

PRESSURE LOSS FOR MEDIUM* TUBES TO AS 1074

TABLE 9.4.2.3

For heavy tubes, the losses are calculated for a flow of 400 L/min from the data given in Section 12.

[†] Calculations for the ringed portions of distribution pipes are to be based on these pressure losses on the total length of each pipe size multiplied by a factor of 0.14.

Where sprinkler protection is to be provided at various height levels, as in storeyed buildings or buildings having basement areas, the above-mentioned maximum allowable pressure loss upstream of the design point(s) on each floor may be increased by an amount equal to the difference in static pressure between the level of the sprinklers on the floor concerned and the level of the sprinklers in the top storey, except that where a system is divided into pressure stages as required by Clause 4.6, no advantage may be taken of the difference in height of sprinklers in another stage.

9.4.2.4 Fully hydraulically calculated systems Where complex piping configuration is involved and where economies in design can be effected, the piping may be designed on the basis of individual hydraulic calculation of pipes throughout the system. Refer to Section 12.

9.4.2.5 Sprinklers in concealed spaces Where sprinkler protection is required by Clauses 5.6.1 and 5.6.2, sprinklers may be fed individually from piping feeding sprinklers in the room below, provided that in determining the size of range pipes up to the design point the sprinklers above and below are taken cumulatively.

9.5 SYSTEM DRAINAGE All pipes shall be arranged with slope for drainage as specified in Clause 7.5.

NOTE: Piping in all systems including piping in wet systems should be arranged to drain to the installation drain valves which should be not less than 40 mm diameter.

SECTION 10 ORDINARY HAZARD CLASS SYSTEMS

10.1 DESIGN DATA Ordinary hazard systems shall be hydraulically designed to provide an appropriate density of discharge over an assumed area of operation (number of sprinklers likely to operate) in all areas including the hydraulically most unfavourable areas of the protected building.

The design density of discharge and the assumed area of operation shall be as follows:

- (a) Design density of discharge 5 mm/min.
- (b) Assumed area of operation:

OH	1																					 	. 72	m ² .
OH	2																•					 	144	m^2 .
OH	3							•														 	216	m^2 .
OH	Spe	cial	(s	ee	Ν	ot	e)					 											360	m^2 .

NOTE: This group is an extension of OH 3 occupancies where flash fires are likely, covering somewhat larger areas of operation, such as might be anticipated in connection with preparatory processes in textile mills and certain other risks (for classification of occupancies, see Clause 2.2.3).

10.2 WATER SUPPLIES

10.2.1 Pressure and flow requirements Water supplies for ordinary hazard class systems shall comply with Table 10.2.1.

TABLE 10.2.1

Occupancy group	Minimum running* pressure	Flow rate
	kPA	L/min
1	100	375
	70	540
2	140	725
	100	1 000
3	170	1 100
	140	1 350
Special	200	1 800
1	150	2 100

PRESSURE AND FLOW REQUIREMENTS FOR ORDINARY HAZARD CLASS SYSTEMS

* The pressure equivalent of the distance in height between the highest sprinkler and the control assembly is added to all pressure values when discharging the relevant flows at the control assembly. The running pressure is measured at the installation gauge.

10.2.2 Minimum capacity of water supplies

10.2.2.1 *Town mains* A town main supply shall be fed from a source of at least 1 ML capacity.

Terminal mains or branch 'dead end' mains of less than 150 mm diameter shall not be used for OH 3 or OH Special systems.

10.2.2.2 Reservoirs and tanks other than pressure tanks The minimum capacities shall be as specified in Table 10.2.2.2. These capacities relate to stored water sources entirely reserved for the sprinkler system (including fire hose reels). For pump suction tanks these capacities may be reduced in accordance with Clause 10.2.2.3, but the maximum period of inflow shall be 1 h.

Where a private car park is strictly incidental to an otherwise light hazard class building, as may occur in office and residential type buildings, the minimum capacity required by Table 10.2.2.2 for a stored water source may, when used as one supply of a duplicate supply system only, be halved provided that the maximum period of inflow for a suction tank relying on automatic inflow shall be halved, i.e. to 30 min.

TABLE 10.2.2.2

Occupancy group	Maximum height of sprinklers in building or stage above lowest sprinkler m	Minimum capacity L
1	15	55.000
1	30	70,000
	45	70 000
	45	
	00	90 000
	/5	100 000
2	15	105 000
	30	125 000
	45	140 000
	60	160 000
	75	175 000
3	15	135 000
	30	160 000
	45	185 000
	60	205 000
	75	220 000
Special	15	160 000
-	30	185 000
	45	205 000
	60	225 000
	75	245 000

WATER STORAGE CAPACITY FOR ORDINARY HAZARD CLASS SYSTEMS

* Where the system is divided into various pressure stages as required by Clause 4.6, the tank capacity may be based on the maximum stage height rather than on the total height of the building. For storeyed buildings in excess of 15 m in height with different hazard classes at various levels, economies may be effected by calculating the minimum capacities of storage tanks, provided that in the calculations of distribution piping no advantage has been taken of the difference in static pressure as allowed in Clause 10.4.2.3. The minimum capacity must be sufficient to supply the pump for 1 h when running at its nominal rating.

The nominal rating of the pump is that point on its characteristic curve which satisfies the formula—

$$Q = K\sqrt{(P-h)}$$

where

Q = rate of flow, in litres per minute

- K = constant as set out in Table 4.10.2
- P = pressure at pump discharge, in kilopascals
- h = pressure equivalent of the height above the pump of the sprinkler array hydraulically nearest the valves, in kilopascals.

The storage capacity shall be not less than that allowed in Table 10.2.2.2 for a building of 15 m for the particular occupancy group.

In fully hydraulically calculated ordinary hazard systems, the water requirement is the maximum calculated demand in litres per minute for the hydraulically most favourable area for a period of 60 min. (See Section 12.)

10.2.2.3 *Pump suction tanks* Pump suction tanks shall have an effective capacity reserved entirely for the sprinkler system not less than that specified in Table 10.2.2.2 except that, where there is an automatic inflow which can be relied upon at all times, a smaller capacity will be allowed, provided that the pump can operate at full capacity for not less than 1 h, subject to the following minimum capacities (see also Clause 4.8.1):

OH 1		25 000 L.
ОН 2	••••	50 000 L.
ОН 3	•••••	75 000 L.
OH Special		. 100 000 L.

10.2.2.4 Supplies not reserved entirely for sprinklers Any private reservoir which also provides water for trade and domestic purposes shall have a constant capacity of at least 1 ML.

10.2.2.5 *Pressure tank* The minimum quantity of water to be maintained in a pressure tank reserved entirely for sprinklers shall be as follows:

(a) Where sole supply (OH 1 only) 46 000 L.

(b) Where duplicate supply (OH 1, 2, 3 and Special) 30 000 L.

The minimum air pressure to be maintained in a pressure tank shall be determined from one of the formulas set out in Clause 4.13.2 and shall be not less than—

OH 1		 		 				 •		•			•	•						• 1	70	kР	a;
OH 2		 		 				 		•										11	10	kP	a;
OH 3		 		 				 		•								1	40	k	Pa;	aı	ıd
OH Sp	ecial	 •		 				 •		•				•						17	70	kР	a;

plus 30 kPa, or the pressure loss in the piping between the pressure tank and the installation gauge, whichever is the greater. The pressure loss in the piping shall include all valves and shall be calculated at the maximum rate of flow for the group (see Clause 10.2.1). Table 10.2.2.5 indicates the required working air pressure for tanks having proportions of air of one-third, one-half and two-thirds.

NOTE: For pressure limitations, see Clause 4.6.

TABLE 10.2.2.5

MINIMUM AIR PRESSURE IN TANKS

Occupancy group	Proportion of air in tank	Minimum air pressure to be maintained in tank when base is level with highest sprinkler kPa	Add for each metre or part thereof where tank is below highest sprinkler kPa
1	One-third	500	30
	One-half	300	20
	Two-thirds	200	15
2	One-third	620	30
	One-half	380	20
	Two-thirds	260	15
3	One-third	710	30
	One-half	440	20
	Two-thirds	330	15
Special	One-third	800	30
	One-half	500	20
	Two thirds	350	15