

व्यापक परिचालन मसौदा

हमारा संदर्भ : सीईडी 22:4/टी -12

22 01 2010

तकनीकी समिति : अग्नि शमन विषय समिति, सीईडी 22

प्राप्तकर्ता :

- 1 सिविल इंजीनियरी विभाग परिषद के सभी सदस्य
- 2 सीईडी 22 एवं सीईडी 22:4 के सभी सदस्य
- 3 रूचि रखने वाले अन्य निकाय

महोदय (यों),

निम्नलिखित मसौदा संशोधन के रूप में सलंगन हैं :

प्रलेख संख्या	शीर्षक
सीईडी 22 (7747)	IS 15105:2002 की संशोधन संख्या 1 का मसौदा

कृपया इस संशोधन के मसौदे का अवलोकन करें और अपनी सम्मतियाँ यह बताते हुए भेजें कि यदि यह मसौदा संशोधन के रूप में प्रकाशित हो तो इन पर अमल करने में आपके व्यवसाय अथवा कारोबार में क्या कठिनाइयाँ आ सकती हैं ।

सम्मतियाँ भेजने की अंतिम तिथि **31 03 2010**

सम्मतित यदि कोई हो तो कृपया अधोहस्ताक्षरी को उपरलिखित पते पर सलंगन फॉर्मेट में भेजें ।

यदि कोई सम्मति प्राप्त नहीं होती है अथवा सम्मति में केवल भाषा सम्बन्धी त्रुटि हुई तो उपरोक्त प्रलेख को यथावत अंतिम रूप दे दिया जाएगा । यदि सम्मति तकनीकी प्रकृति की हुई तो विषय समिति के अध्यक्ष के परामर्श से अथवा उनकी इच्छा पर आगे की कार्यवाही के लिए विषय समिति को भेजे जाने के बाद प्रलेख को अंतिम रूप दे दिया जाएगा ।

यह प्रलेख भारतीय मानक ब्यूरो की वेबसाइट पर भी डाला जा रहा है ।

धन्यवाद ।

भवदीय

इंजीनियरी)

सलंगन : उपरलिखित

(ए .के . सेनी)

वैज्ञानिक 'एफ' एवं प्रमुख (सिविल

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**DRAFT IN
WIDE CIRCULATION**

DOCUMENT DESPATCH ADVICE

Reference	Date
CED 22:4/T- 12	22 01 2010

TECHNICAL COMMITTEE: FIRE FIGHTING SECTIONAL COMMITTEE, CED 22

ADDRESSED TO :

1. Interested Members of Civil Engineering Division Council, CEDC
2. All members of CED 22 & CED 22:4
3. All others interested

Dear Sir,

Please find enclosed the following amendment :

Doc No.	Title
CED 22(7747)	Draft Amendment No. 1 to IS 15105:2002 Design and Installation of Fixed Automatic sprinkler fire extinguishing system – Code of Practice

Kindly examine the draft amendment and forward your views stating any difficulties which you are likely to experience in your business or profession, if these are finally adopted as amendments to National Standards.

Last Date for comments : **31 03 2010**

Comments if any, may please be made in the format as given overleaf and mailed to the undersigned at the above address.

In case no comments are received or comments received are of editorial nature, you will kindly permit us to presume your approval for the above document as finalized. However, in case of comments of technical in nature are received then it may be finalized either in consultation with the Chairman, Sectional Committee or referred to the Sectional Committee for further necessary action if so desired by the Chairman, Sectional Committee.

The document is also hosted on BIS website **www.bis.org.in**.

Thanking you,

Yours faithfully,

(A.K. Saini)
Sc `F' & Head (Civil

Engg.)
Encl: as above

email : ced@bis.org.in

FORMAT FOR SENDING COMMENTS ON BIS DOCUMENTS

(Please use A4 size sheet of paper only and type within fields indicated. Comments on each clause/subclause/table/fig etc. be started on a fresh box. Information in column 3 should include reasons for the comments and suggestions for modified working of the clauses when the existing text is found not acceptable. Adherence to this format facilitates Secretariat's work)

Please e-mail your comments to ced@bis.org.in or s.chaturvedi@bis.org.in or Fax to 011 23235529

NAME OF THE COMMENTATOR/ORGANIZATION:

DOC. NUMBER AND TITLE:

Sl.No. (1)	Clause/Subclause/ Para No. (2)	Comments/suggestions (3)

**Draft AMENDMENT No. 1
To
IS 15105:2002 DESIGN AND INSTALLATION OF FIXED AUTOMATIC
SPRINKLER FIRE EXTINGUISHING SYSTEM – CODE OF PRACTICE**

[Page 22, clause 10] - Add the following new subclause:

10.4 Chlorinated Poly Vinyl Chloride (CPVC) Piping and support systems

10.4.1 Chlorinated Poly Vinyl Chloride (CPVC) pipes and fittings may be used for installation of wet pipe Sprinklers system for Light Hazard Class fire protection service as per 5.1.1 as an alternative to existing metallic pipes and fittings.

10.4.2 The pipes and fittings shall have a rated pressure of 12.3 kg/cm² at 65° C.

10.4.3 The dimensions of the CPVC pipes and fittings shall be compatible with IS 1239 Part 1 and shall be as follows:

Nominal Size mm	Mean Outside Diameter, mm		Outside Diameter at any point, mm		Wall Thickness mm SDR 13.5		
	Min	Max	Min	Max	Avg Max	Min	Max
20	26.60	26.80	26.20	27.20	2.47	1.98	2.49
25	33.30	33.50	32.90	33.90	2.97	2.46	2.97
32	42.10	42.30	41.60	42.80	3.63	3.12	3.63
40	48.10	48.30	47.60	48.60	4.09	3.58	4.09
50	60.20	60.40	59.70	60.90	5.00	4.47	5.00
65	72.90	73.10	72.30	73.70	6.07	5.41	6.07
80	88.70	89.10	88.20	89.60	7.37	6.58	7.37

10.4.4 CPVC Pipe Material

10.4.4.1 The material from which the pipes and fittings are produced shall consist substantially of Chlorinated Poly Vinyl Chloride with not less than 60% chlorine content when tested in accordance with Annexure B of IS 15778 : 2007

'Chlorinated Poly Vinyl Chloride (CPVC) pipes for potable hot and cold water distribution supplies – Specification'.

10.4.4.2.1 Physical & Chemical Properties

The internal and external surfaces of the pipes shall be smooth, clean and free from grooving and other defects and shall have the following properties:

Sr. No.	Characteristics	Units	Requirements	Test Parameters	Method of test
1	Density	kg/ m ³	1530 to 1550	27± 2 °C	IS 7328
2	Opacity	%	0.2 max	27± 2 °C	IS 12235 (Part 3)
3	Reversion	%	≤ 5	150 °C	IS 12235 (Part 5)
4	Vicat Softening Point	°C	≥ 112	-	IS 12235 (Part 2)

10.4.4.2.2 Mechanical Properties

1	Falling weight impact test (Resistance to external blow at 0°C)	-	-	-	As per method Annex. C of IS 4985
2	Internal Hydrostatic Burst Pressure test	kg/cm ²	Shall not burst up to 70 kg / cm ²	27± 2°C	IS 12235 (Part 8)
3	Tensile strength	kg/cm ²	560	27± 2 °C	IS 12235 (Part 13)
4	Tensile Modulus	kg/cm ²	28475	27± 2 °C	IS 12235 (Part 13)
5	Flattening		60% of outer		IS 12235 (Part 2)

10.4.5 Fire Exposure Test

CPVC pipes and fittings shall be fire tested at 760⁰ C for 10 minutes as per test procedure given in **Annexure A**. During fire testing pipe and fitting assemblies shall not burst, separate or leak and shall maintain the sprinkler in the intended operating position. Following the fire exposure, the pipe and fitting assemblies shall withstand an internal hydrostatic pressure equal to the maximum rated pressure for 5 minutes without rupture or leaks.

10.4.6 CPVC Fire Sprinkler Pipes and Fittings – Jointing System

10.4.6.1 Cutting

CPVC pipe can be easily cut with a ratchet cutter, wheel type plastic tubing cutter, a power show or a fine toothed saw. To ensure that the pipe is cut square, a miter box must be used when using a saw. Cutting the pipe as squarely as possible provides the surface of the pipe with a maximum bonding area. If any indication of damage or cracking is evident at the pipe end, cut of at least 50 mm beyond the visible crack.

10.4.6.2 Deburring

Burrs and filings can prevent proper contact between pipe and fitting during assembly and must be removed from the outside and inside of the pipe. A chamfering tool or file is suitable for this purpose. A slight bevel shall be placed at the end of the pipe to erase entry of the pipe into the socket and minimize the chances of wiping solvent cement from the fitting.

10.4.6.3 Fitting Preparation

Using a clean, dry rag, wipe loose dirt and moisture from the fitting socket and pipe end. Moisture can slow the cure time and at this stage of assembly, excessive water can reduce joint strength. Check the interference fit of the pipe and fitting. The pipe should enter the fitting socket easily 1/4 to 3/4 of the way. At this stage, the pipe should not bottom out in socket.

10.4.6.4 Solvent Cement Application

Joining surfaces shall be penetrated and softened. Cement must be provided with the pipe and fittings. Cement shall be applied (worked into pipe) with an applicator 1/2 the size of the pipe diameter. Apply a heavy, even coat of cement to the outside pipe end. Apply a medium coat to the fitting socket. Pipe sizes 32 mm and above shall always receive a second cement application on the pipe end.

Special care shall be exercised when assembling CPVC systems in extremely low temperatures (below 4⁰ C) or extremely high temperatures (above 45⁰ C). Extra set times shall be allowed in colder temperatures. When cementing pipe and fitting in extremely cold temperature make certain that the cement has not “gelled”. Gelled cement must be discarded. In extremely hot temperatures, make sure both surfaces to be joined are wet with cement when putting them together.

10.4.6.5 Assembly

Immediately insert the pipe in to the fitting socket, while rotating the pipe ¼ turn. Properly align the fitting for the installation at this time. Pipe must bottom to the stop. Hold assembly for 10 to 15 seconds to ensure initial bonding. A bead of cement should be evident around the pipe and fitting juncture. If this bead is not continuous around the socket shoulder, it may indicate that insufficient cement has been applied. If insufficient cement has been applied, discard the fitting and begin again. Cement in excess of the bead can be wiped off with a rag. Care should be exercised when installing sprinkler heads. Sprinkler head fitting shall be allowed to cure for a minimum of 30 minutes prior to installing the sprinkler head. When installing sprinkler heads be sure to anchor or hold the sprinkler adapter fitting securely to avoid rotating the pipe in previously cemented connections. Previously cemented fittings shall also be permitted to cure for a minimum of 30 minutes.

10.4.6.6 Set and Cure Times

Solvent cement set and cure times are a function of pipe size, temperature, relative humidity, and tightness of fit. Drying time is faster for drier environments, smaller pipe sizes, high temperatures, and tighter fits. The assembly must be allowed to set, without any stress on the joint for 1 to 5 minutes, depending on the pipe size and temperature. Following the initial set period, the assembly can be handled carefully avoiding significant stresses to the joint. Refer to the cure tables for minimum cure times prior to pressure testing.

Table 1: Ambient Temperature Cure Times for Test Pressures of 15.8 kg/cm² (maximum)

Nominal Pipe Size (Metric)	16°C to 49°C	4°C to 15°C	-18°C to 3°C
20 mm	1 hour	4 hours	48 hours
25 mm	1-1/2 hours	4 hours	48 hours
32 & 40 mm	3 hours	32 hours	10 days
50 mm	8 hours	48 hours	Note 1
65 & 80 mm	24 hours	96 hours	Note 1

Table 2: Ambient Temperature Cure Times for Test Pressures of 14 Kg/Cm² (maximum)

Nominal Pipe Size (Metric)	16°C to 49°C	4°C to 15° C	-18°C to 3° C
20 mm	45 minutes	1 1/2 hours	24 hours
25 mm	45 minutes	1 1/2 hours	24 hours
32 & 40 mm	1-1/2 hours	16 hours	120 hours
50 mm	8 hours	36 hours	Note 1
65 & 80 mm	8 hours	72 hours	Note 1

Note 1: Solvent cement can be applied at temperatures below 4.4°C in all sizes. However, for the 50 mm size & larger, the temperature must be raised to 4.4°C or above and allowed to cure as per the recommended times before the system is filled and pressurized.

Table 3: Ambient Temperature Cure Times for Test Pressures of 7.0 kg/cm² (maximum)

Nominal Pipe Size (Metric)	16°C to 49°C	4°C to 15° C	-18°C to 3° C
(20 mm)	15 minutes	15 minutes	30 minutes
(25 mm)	15 minutes	30 minutes	30 minutes
(32 mm)	15 minutes	30 minutes	2 hours

NOTE: 40 mm and larger must be tested ONLY in accordance with Table 1 and Table 2.

10.4.7 Hangers & Supports

CPVC pipes are rigid and require fewer supports than flexible plastic systems. Supporting arrangements as shown in figure 15 under **10.3.15** are usually suitable for CPVC pipes also. The Hangers shall not have rough or sharp edges which come in contact with the pipe. These hangers must have a minimum 13 mm, load-bearing surface, and they must be selected to accommodate the specific pipe size. The support spacing for CPVC pipes SDR 13.5 shall be as follows:

Table A - Standard Support Spacing

Nominal Size, (mm)	Max. Support Spacing, (m)
20	1.67
25	1.83
32	1.98
40	2.13
50	2.43
65	2.74
80	3.05

The maximum support spacing distance for Sprinkler head drop Tee shall be as follows:

*Table B Maximum Support Spacing Distance
In Line Sprinkler Head Drop Tee*

Nominal Pipe Size (mm)	Less than 7.0 kg	More than 7.0 kg
20 mm	1.22 m	0.91 m
25 mm	1.52 m	1.22 m
32 mm	1.83 m	1.52 m
40 - 80 mm	2.13 m	2.13 m

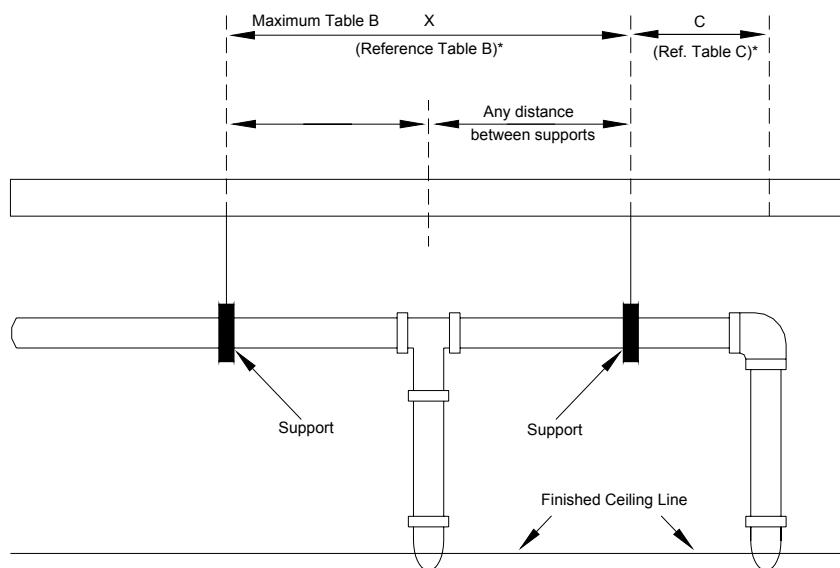
The maximum support spacing distance for Sprinkler head drop elbow shall be as follows:

*Table C Maximum Support Spacing Distance
End Sprinkler Head Drop Elbow*

Nominal Pipe Size (mm)	Less than 690 kPa	More than 690 kPa
20 mm	228.6 mm	152.4 mm
25 mm	304.8 mm	228.6 mm

32 mm	406.4 mm	304.8 mm
40 – 80 mm	609.6 mm	304.8 mm

Support Spacing Drop Elbow and Drop Tee



10.4.8 Hydraulic Design

C Factor

Hydraulic calculations for the sizing of CPVC pipe and fitting shall be calculated using the Hazen Williams C factor of 150.

Pipe Friction Loss

Pipe Friction loss calculations shall be made according to the following formula:

$$\Delta\rho = 6.05 * 105 * Q^{1.85} * C^{-1.85} * d^{-4.87} * l$$

Where,

- $\Delta\rho$ = Pressure Drop in Bar
- Q = Flow in l/min
- C = Hazen William C factor of 150 for CPVC
- d = inside diameter in mm
- l = Length of pipe for which the friction loss has to be calculated, being the sum of the length of pipe and the equivalent pipe allowance for fittings

Fitting Friction Loss

The following table shows the allowance for friction loss for fittings, expressed as equivalent length of pipe.

Allowance for Friction Loss in Fittings (SDR 13.5 Equivalent Pipe)							
	20 mm	25mm	32mm	40 mm	50 mm	65 mm	80 mm
Tee Branch	0.91 m	1.52 m	1.83 m	2.44 m	3.05 m	3.66 m	4.57 m
Elbow 90	2.13 m	2.13 m	2.44 m	2.74 m	3.35 m	3.66 m	3.96 m
Elbow 45	0.31 m	0.31 m	0.61 m	0.61 m	0.61 m	0.91 m	1.22 m
Coupling	0.31 m	0.31 m	0.31 m	0.31 m	0.31 m	0.61 m	0.61 m
Tee Run	0.31 m	0.31 m	0.31 m	0.31 m	0.31 m	0.61 m	0.61 m

Annexure A
(Clause 10.4.5.)

Fire Exposure Test

A.1.1 The fire source employed in these tests is to consist of a square steel pan containing n-heptane. The pan is to be a 0.46 m² area and 305 mm deep, constructed of steel not less than 6.4 mm thick. The pan is to be liquid tight and the top edges are to be reinforced by a continuous steel angle section. The fire source pan is to be filled with 23.7 l of n-heptane having the characteristics specified as given in table 4. The pan is to be placed in a square 0.92 m² liquid tight pan, 300 mm deep, constructed of steel not less than 6.4 mm thick with the top edge reinforced by a continuous steel angle. The 0.92 m² pan is to be filled with water and fresh water is to be flowed into it during the fire test.

Table 4 n-haptane characteristics

Distillation

Initial boiling Point	90 ⁰ C
50 Percent	93 ⁰ C
Dry Point	96.5 ⁰ C
Specific Gravity	0.719 Gm/cc
Reid Vapor Pressure	0.14 kg/cm ²
Research Octane Rating	60
Motor Octane Rating	50

A.1.2 The test room employed for these tests is to be essentially draft free and is not to be smaller than 9.1m X 9.1m X 4.6m high. A 3.7m wide by 7.3m long test ceiling is to be installed approximately 2.4m above the floor.

A.1.3 The piping arrangements is to be attached to a water supply capable of supplying a pressure equal to the maximum rated pressure at the inlet of the piping. The system water supply is to be equipped with flow meters and pressure gauges.

A.2 Fire Test with Low Flowing Pressure

A.2.1 The test is to be conducted with closed pendent sprinklers installed as a maximum 15 feet (4.6 m) spacing at the ends of a balanced flow piping

arrangement. The piping arrangement is to be connected to the water-supply. The piping is to have an initial static pressure of 7.0 Kg/cm² to 8.0 Kg/cm² which is then to be adjusted to maintain the specified flow after sprinkler operation. See figure for the general test arrangement (fig a)

A.2.2 If the piping is intended to be installed at the ceiling wall junction, a test is also be conducted with two standard side wall sprinklers installed at a maximum 4.3 m spacing at the end of a balanced flow piping arrangement. The piping arrangement is to be connected to the water supply. The piping is to have an initial static pressure of 7.0 Kg/cm² to 8.0 Kg/cm² which is then to be adjusted to maintain the specified flow after sprinkler operation. See figure for the general test arrangement (fig b)

A.2.3 The test timer and temperature measuring equipment are to be started when the test pan is ignited. The sprinklers are to be allowed to operate automatically. After operation of each sprinkler, the flow is to be adjusted to maintain a total flow equal to a maximum of 22.5 gpm per sprinklers.

A.2.4 After 10 minutes, the fire source in the pan is to be extinguished and the water supply to the sprinklers is to be turned off a maximum of 5 minutes after the fire source is extinguished.

A.3 Fire Test with maximum rated flowing pressure

A.3.1 The tests described in **A.2.1** to **A.2.4.** are to be repeated with the pressure equal to the maximum rated pressure introduced into the inlet of the piping arrangement. After sprinkler operation, 90 percent of the maximum rated pressure is to be maintained.