

Report of the Action Research

AR 0017

on

Evaluation of Preparedness; and Promotion of First-Aid/Portable Fire Extinguishers in Existing Residential Buildings; towards Enhancing Fire Safety

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0 BACKGROUND

There has been a notion based on the number of fire calls actually received at the various fire services that low rise residential buildings (particularly 1 or 2 family dwellings) are fire safe. The material of construction (brick/block walls, concrete roofs), more than 1 entry/exit to the building seem to indicate that low-rise residential buildings are safe havens. Further, there is no requirement of any fire extinguisher as per the current Indian Standards or the National Building Code of India (NBC 2016).

On the other hand, the developed countries insist for fire extinguisher in their kitchen, in particular. Sweden for example despite having a regulation to have fire extinguisher, report a yearly average of 6,000 fire incidents in residential buildings. Also, the International Building Code (IBC 2015) require that all buildings under one of the three hazard occupancies namely light hazard occupancy (where residential units fall) require to have at least 1 fire extinguisher for every 3,000 sqft area of the building. The requirement of Brazil is similar to that of India (**NIL** for 1 or 2 family dwelling units) and extinguishers & hose reels for multifamily apartment type buildings even low rise (< 15 m in height). However, statistics in the city of Sao-Polo indicate there is 3 times more incidence of fire in 1 or 2 family units than the high rise residential ones. The above indicate that a fire extinguisher is either a common part or is necessary for all types of residential buildings.

The 2011 census data of Govt of India indicate that out of the over 30.4 crore household in the country of which concrete roof account for over 9 crores and 4.8 crores houses have combustible roofs including polythene based. There can be no second thought that all of these 5 crore houses definitely require at least 1 fire extinguisher. Use of LPG fuel (Ujjwala scheme) and electrification (Sowbhagya scheme) of all villages have not only improved the basic comfort and livelihood but also have increased the fire load. Further around 85% of these 9 crore buildings are 1 or 2 family independent residential housings which are currently vulnerable to fire as there is no mandatory requirement of a fire extinguisher.

Same as any State Building Department, the fire authorities in the country (including in the urban areas and capital city, New Delhi) have a huge deficit of manpower. More than relying on such highly stressed system to attend the fires, as a preventive/precautionary measure, installing first-aid fire fighting systems as mentioned above is bound to provide a safe habitat. Enacting statutes to address the above may seem a simple solution, but the sheer volume of actual fire fighting systems to be manufactured to each of the existing 80% households (other than highrises) in India needs tremendous manufacturing effort. Insistence of this cause on safety is definitely bound to also help the manufacturing sector including MSMEs.

References:

<http://censusindia.gov.in/2011census/Hlo-series/HI3A.html>

<https://www.brandskyddsforeningen.se/globalassets/brandforsk/bostadsbrander/rapporter/characteristics-of-fatal-residential-fires-in-sweden.pdf>

<https://www.tandfonline.com/doi/abs/10.1080/09613219408727344?journalCode=rbri20>

1 AIM

Enhancing the fire safety in residential buildings.

2 OBJECTIVE

The objective of this Action Research is towards:

- 1) increasing the fire safety of existing residential buildings in the country.
- 2) promoting use of first aid fire extinguishers conforming to Indian Standards in residential buildings.
- 3) comparison of Indian Standards with international standards/practices in terms of requirements of installation of fire extinguishers in residential buildings, particularly to 1 or 2 family dwellings in India which do not have any fire extinguisher but constitute over 90% of residential buildings.

3 METHODOLOGY

The following details the methodology involved:

- 1) Observe if the existing buildings having extinguishers are actually genuine (as per IS 15683), working and are ISI marked so as to increase the prospects of fire safety.

While it was proposed that the methodology shall be through surveys to be conducted manually by visiting various residential units in the NCR region, about 100 in old Delhi, New Delhi, Noida, Greater Noida, Ghaziabad, Faridabad, Gurugram; due to the onset and continuation of the COVID-19 pandemic, online survey was conducted between the period between 19 March 2021 and 02 April 2021. Annex lists the questionnaire as in the online survey.

- 2) A thorough Literature Study of comparison of Indian Standard requirements vis-à-vis developed and other developing countries regarding their approach for fire safety in 1 or 2 family dwelling units.
- 3) Propose if extinguishers can be recommended in Indian Standards for 1 or 2 family dwellings based on the survey to find out incidences of fire in the past around 10 years.

4 RESEARCH ACTION

The survey questionnaire was devised in a way to assess the existing realities in the residences in the country and also towards finding out whether the residential buildings are equipped with the active fire suppression elements as enshrined in NBC. Further, the questionnaire was developed to find out the users awareness about the extinguishers, experience in using them; awareness of their fire safety plan and what to do during emergency.

5 ANALYSIS

5.1 The analysis of the responses to questionnaire was carried out vis-à-vis the Part 4 Fire and Life Safety provisions of the National Building Code of India 2016 (NBC 2016) and that of IS 2190, the Indian Standard Selection, Installation and Maintenance of First Aid Fire Extinguishers – Portable and Mobile – Code of Practice (*fourth revision*).

5.2 Details of the analysis of response to the questionnaire is given below:

5.2.1 Respondents

Total number of respondents was **327 in all** who were living in:

Ground OR Ground + 1 residence building (Two or less floors)	95	Low Rise Building (204)
3 to 4 storied building	109	
5 th to 10 th storied building	61	High Rise Building (123)
11 or more storied building	62	

28 respondents are living in single storied one family dwelling.

59 respondents are living in single storied building which can house more than 1 family.

Number of respondents living in 2 storied (G+1) buildings that can house:

6 or more families = **17**

5 families = **8**

4 families = **1**

3 families = **14**

2 families = **22**

1 family = **42**

Number of respondents living in ground floor of any building = **73**

Number of respondents living in first floor of any building = **75**

5.2.2 Fire Extinguisher Availability in Residential Building

Number of respondents indicating that there is **no fire extinguisher** in their building = **227**

Of which 83 are living in Two or less floors (G/ G+1 buildings)

80 are in 3 to 4 storied buildings

36 are in 5 to 10 storied buildings

28 are in 11 or more storied

Number of respondents indicating that there is **a fire extinguisher** within their residence = **100**

Of which 12 are living in Two or less floors (G/ G+1 buildings)

29 are in 3 to 4 storied buildings

25 are in 5 to 10 storied buildings

34 are in 11 or more storied

114 respondents indicated that their building corridor has a fire extinguisher and **213** responded having no extinguisher in the corridor.

20 responded that they have extinguisher within their home but there is none in the corridor or public space in their building.

80 responded that they have extinguisher both within their house and in the corridor of their building.

5.2.3 Fire Extinguisher Usage

Only **44** respondents indicated to **have used fire extinguishers** on their own or by their family members.

55 responded that their neighbor had used an extinguisher in the residential building complex.

5.2.4 Fire Extinguishers in Workplace (by the Same Respondents)

Fire Extinguisher in their Workplace	Response	Percentage
Available	208	64%
Not available	95	29%
Not sure / don't know	24	7%
Total	327	100%

5.2.5 Fire Hydrant System in Residential Building

Analysis on the hydrant system in residential building is given below:

Building type	Hydrant System is AVAILABLE	Hydrant System is NOT AVAILABLE	
11 or more storied building	60	2	
5 to 10 storied building	42	19	
3 or 4 storied building	12	97	
2 or less storied building	4	91	
Total	118 (36%)	209 (64%)	327 (100%)

5.2.6 Awareness About ISI Marked Fire Extinguishers

The awareness level about the Indian Standard specification for fire extinguisher as per IS 15683 is:

Not aware	:	94
Aware	:	233

5.2.7 Sprinklers

283 respondents said they have **no automatic fire sprinkler within their house/flat** of which:

52 are living in 5 to 10 storied buildings	High Rise Building
33 are living in 11 or more storied building	
109 are living in 3 or 4 storied buildings	Low Rise Building
89 are living in 2 or less storied building	

42 respondents said they **have automatic fire sprinkler within their house/flat** of which:

08 are living in 5 to 10 storied buildings	High Rise Building
29 are living in 11 or more storied building	
05 are living in 2 or less storied building	Low Rise Building

5.2.8 Smoke Detectors

295 respondents said they have **no smoke detector within their house/flat** of which:

53 are living in 5 to 10 storied buildings	High Rise Building
45 are living in 11 or more storied building	
107 are living in 3 or 4 storied buildings	Low Rise Building
90 are living in 2 or less storied building	

32 respondents said they **have smoke detector within their house/flat** of which:

08 are living in 5 to 10 storied buildings	High Rise Building
17 are living in 11 or more storied building	
02 are living in 3 to 4 storied building	Low Rise Building
05 are living in 2 or less storied building	

5.2.9 Fire Drills

270 respondents said that there were **no fire drills** conducted in their residential premises.

57 respondents said they **fire drills were conducted in their premises** of which:

Residential building type	Number of responses
11 or more storied building	30
5 to 10 storied building	14
3 or 4 storied building	5
2 or less storied building	8

5.2.10 Visit by Fire Services in the Last 10 Years

56 respondents indicated that there was a visit of fire service team within the last 10 years of which:

Visits by Fire Service in:	Number of responses
11 or more storied building	19
5 to 10 storied building	12
3 or 4 storied building	14
2 or less storied building	10
Total	56

271 respondents indicated there was no visit/requirement as in:

Visits to:	Number of responses
11 or more storied building	43
5 to 10 storied building	49
3 or 4 storied building	95
2 or less storied building	84
Total	271

5.2.11 Distance of Fire Station

Distance	Number of Response	Sample PIN Code starting with
Less than 5 km	194	11, 12, 14, 15, 16, 17, 19, 20, 22, 24, 26, 30, 36, 38, 39, 40, 41, 42, 43, 44, 48, 50, 51, 52, 56, 57, 60, 62, 63, 64, 80, 87
6 km to 10 km	105	10, 11, 12, 14, 16, 20, 21, 22, 27, 30, 31, 34, 36, 38, 39, 40, 42, 44, 45, 49, 50, 56, 60, 62, 64, 75, 77, 80,
11 km to 15 km	17	21, 22, 40, 42, 56, 60, 68
16 km and above	11	273, 38, 415, 421, 56, 69

5.2.12 Balcony In Residences

Building type	NO balcony is present	Balcony is present	Ground storey units having no balcony
11 or more storied building	10	49	3
5 to 10 storied building	12	47	2
3 or 4 storied building	20	74	15
2 or less storied building	09	59	27
Total	51	229	47

5.2.13 Number of Escape Routes/ Staircases/ Doors

(including the main entrance door) available to get out in case of any emergency

Building type	Only One (Main door)	Two Routes	3 or More Routes
11 or more storied building	37	19	6
5 to 10 storied building	41	16	4
3 or 4 storied building	82	16	11
2 or less storied building	49	34	12
Total	209	85	33

5.2.14 Manual Call Point (Break Glass / Pull Down)

Building type	MCP is available	No MCP
11 or more storied building	43	19
5 to 10 storied building	26	35
3 or 4 storied building	7	102
2 or less storied building	3	92
Total	79	248

5.2.15 Fire Blanket in Kitchen

Building type	Blanket is Available	Blanket is NOT AVAILABLE
11 or more storied building	5	57
5 to 10 storied building	4	57
3 or 4 storied building	6	103
2 or less storied building	6	89
Total	21	306

5.2.16 Car Parking & its Fire Protection

(including the main entrance door) available to get out in case of any emergency

Building type	Car Parking is Available	Fire Extinguisher is available in Car Parking	% of residences not having extinguishers in Car Parking Area
11 or more storied building	49	33	33%
5 to 10 storied building	41	11	73%
3 or 4 storied building	54	8	85%
2 or less storied building	21	1	95%
Total	165	53	

5.3 A study of the codes/standard developed and used by countries other than India indicate the requirement regarding use of fire extinguishers in 1 or 2 family dwellings (low rises) as given in Table below.

Table 5.3 Requirement of Fire Extinguishers in 1 or 2 Family Dwelling

SI No.	Country / State/ City	Code / Law/ Regulation	Requirement of Fire Extinguisher in 1 or 2 Family Dwelling
1)	USA	NFPA 1 : 2018	Not required
2)	India	NBC 2016	Not required
3)	New Jersey	Legislature amended and enacted P.L.1991, c. 92 (C.52:27D-198.1)	Required
4)	United Arab Emirates	Fire and Life Safety Code, 2011	Required
5)	Hong Kong	Code of Practice for Fire Safety in Buildings, 2011	Required
6)	United Kingdom	The Building Regulations, 2010 <i>(for landlords)</i>	Required
7)	Australia	Australian Fire Regulations - Queensland, 2020	Required
8)	Japan	Building Standard Law, 2013	Required

6 RECOMMENDATION

6.1 Various States and UTs in India (over 23 in number) have either Fire Safety related Acts / Rules / Regulations which in turn are cross referring to the Part 4 Fire and Life Safety of National Building Code of India 2016 (**NBC 2016**). The Part 4 however requires no installation in a 1 or 2 family dwelling towards fire protection. Since the first version in 1970 and in its 1983 and 2005 version, NIL requirement was prescribed for such buildings.

IS 2190:2010 Selection, installation and maintenance of first-aid fire extinguishers — Code of practice (*fourth revision*) however cites 1 or 2 family houses (residential buildings) as light hazard occupancy having class A fire load. The standard recommends installation of fire extinguishers in such 1 or 2 family houses that are classified under type A fires. For light hazard occupancy, for every 200 m² of floor area either one 9 l water type extinguisher OR 5/6 kg ABC powder extinguisher has been recommended.

However, the law of the land, as per concerned local byelaws, is NBC 2016 whose Table 7, does not require/mandate any fire extinguisher for use in the country.

Developed countries and developing countries are also largely mandating the use of fire extinguishers in similar 1 or 2 family dwellings. This is also based on their experience and losses incurred as a result of fires in such buildings as per the literature surveyed.

6.2 Thus, considering that the fire load in modern buildings are much more than traditional timber furniture buildings, the recent research study that modern buildings have three times more fire load than those buildings in the 1990s, higher number of calls to 101 (including cities like Delhi) it is prudent that the first aid fire extinguishers are required in 1 or 2 family dwellings.

6.3 Towards enhancing the fire safety in the country, particularly in the kitchen of 1 or 2 family dwellings, a fire blanket complying with **IS 15381:2021** Fire blanket — Specification (*first revision*) is also recommended for consideration to the relevant technical committees namely Fire Safety Sectional Committee, CED 36 and the National Building Code of India Sectional Committee, CED 46.

ANNEX 1*QUESTIONNAIRE USED IN THE SURVEY*

The Questionnaire was proposed earlier to be done door to door in about **100 residences** in the NCR of Delhi. But due to prevailing pandemic situation, an online survey was conducted through: <https://forms.gle/xGFKRUdoTHYrEYo3A> between 19 March 2021 and 02 April 2021.

A total of **327 responses** were received against the questions having the below mentioned response options.

- a) **How many floors are there in your residential building?**
≤ 2 floors; 3-4 floors; 5-10 floors; 11 or more floors
- b) **In which floor do you reside?**
Pick a number (0 for ground floor; 1 for first floor; 2 for second floor; and so on)
- c) **Is there a fire extinguisher within your house?**
YES / NO
- d) **Is there a fire extinguisher in the corridor/ lift lobby/ near the entrance of your house**
YES / NO
- e) **Is there a fire sprinkler installed in atleast one room your house?**
YES / NO
- f) **Is there a fire OR smoke detector installed in atleast one room of your house?**
YES / NO
- g) **Did you OR your family member ever happen to use the fire extinguisher in your house (residence)?**
YES / NO
- h) **Did you ever notice/come to know if your neighbour used a fire extinguisher in his house/in any other building of your housing complex?**
YES / NO
- i) **Was there any visit by firemen/fire engine within the last 10 years in your residential building/in any building of your housing complex?**
YES / NO

- j) **What is the age of your residential building?**
< 4 years; 5-10 years ; 11-20 years; 21 years or more
- k) **Roughly, how far is the nearest firestation (*who responds when 101 is dialed*)?**
< 5 km; 6-10 km; 10-15 km; 16 or km
- l) **Whether any fire drill was conducted in your residential building, in the last 5 years ?**
YES / NO
- m) **How many escape routes/staircases/doors (including the main entrance door) are available to get out from your residence, in case of an emergency?**
1; 2; 3; 4
- n) **Is there a balcony in your residence (*Ground storey residents to skip this, please don't click on NO*)**
YES / NO
- o) **Is car parking available in any floor (stilt OR ground OR basement storey) within your building? (skip this question if it is open air car parking)**
YES / NO
- p) **Is there any fire extinguisher in the floor for car parking? (skip this question if it is open air car parking)**
YES / NO
- q) **Is there a manual call point (the one mentioning, BREAK GLASS IN CASE OF FIRE or PULL, IN CASE OF FIRE) in the floor of your residence?**
YES / NO
- r) **Is there a METRO RAIL/ LITE RAIL/BRT (Bus Rapid Transit) facility in the city/town your residential building is located?**
YES / NO
- s) **Is there an Electrical Multiple Unit train / MRTS (Mass Rapid Transit System) TRAM facility in the city/town your residential building is located?**
YES / NO
- t) **Is there any Airport or Seaport/Harbour facility in the city/town your residential building is located?**
YES / NO

u) *(Optional)* **Would you like to enter the first 2 digits of the pincode of your residence? (type 11 for PIN Code - 110002)**
<Type the first 2 digits, without any gap>

v) **Is there a fire extinguisher in the place where you work or study?**
YES / NO

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