

# **A QUALITATIVE APPROACH TO CHILDREN OF DEVELOPING COUNTRIES FROM HUMAN BEHAVIOUR IN FIRE ASPECT**

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## **SUMMARY**

*Human behaviour in fire needs to be detailed and focused, beyond a totalised and normalized understanding of human. Childhood constitutes a segment, where this understanding has to be applied.*

*There has been an appreciable consciousness on safety of children, concentrated on principally as victims and fire setters. However, beyond these aspects, children have to be studied, as an occupant sub-group, which introduce and effect behaviour patterns under fire, neither reducible nor comparable to adults.*

*This study is an approach to children beyond a normalised conception of human and children. Being in a developed or developing country and age are the two basic parameters to develop the children's behaviour upon.*

## **1. FOREWORD**

The outcomes presented here are the results of a study and research made for the design of a Children's Fire and Earthquake Training Center, for a local insurance company, namely Aksigorta. The survey and research before the erection of the centre and the empirical, observational studies made during and after the training constitute the basis for this paper. The possibilities of such a training centre, which is acting merely as a laboratory, constitutes the main limitation of the study.

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## **2. INTRODUCTION**

Whether in a developed or developing country, an important section of the fire victims are children. Specially in the developing countries, analysis of the actual losses have made children one of the principal focus of interest from fire safety aspect, where several research and education programs have been developed and under progress. These studies see "children and fire", mainly from two aspects :

- children as victims of fire,
- children as fire setters.

Hence the education or changing the mind-set is focused on these two aspects, where the main emphasis is on reducing the risks exposed during childhood. Meantime, lifetime valid tools of safety and survival techniques are also aimed.

However, from performance-based design and human behaviour aspects, these two approaches towards children become insufficient. It needs to be enlarged, to cover children as an object segment of occupant and a parameter to other occupant groups, to constitute sub-groups of occupant behaviour.

In such a course of an approach, performance-based codes are more favourable than deemed-to-satisfy codes, in developing countries, compared with developed countries. Because in developing countries, personal and social diversities are so deep that, it is almost impossible to speak of a “normalised concept of children”. Hence, from technical aspect, performance-based approach allows the engineer to be flexible enough to appreciate and include the diversities. From the economical and efficiency aspect as well, performance-based approach is more cost-efficient and has a wide range of flexibility in tools and means of performance, since deemed-to-satisfy codes are developed according to the local needs and experience of developed countries. Also, safety, essentially being a concept and leading concern of developed countries, mere adoption of prescriptive codes is away from meeting the local expectations.

However, although performance-based design is promising, progress needs investment and further research due to the lack of specific, accurate and in-depth knowledge of children behaviour, both in terms of historical and methodological data.

### **3. PURPOSE & SCOPE**

The purpose of this study is mainly to arouse correct and meaningful questions, while presenting certain empirical outcomes based on the survey and observations made, about children behaviour patterns related with fire, i.e. behaviour in fire prevention, behaviour to fire, behaviour to survival. However, study does not cover behaviour, when subject to fire alarm, sound response, safety sign identification, home alone, etc.

The study is based on an engineering design project, where a “Children’s Training Centre for Fire and Earthquake Safety” is built for a local insurance company, as a non-profit social responsibility. The centre is equipped with training aids and sets, all being designed exclusively for children, including a smoke labyrinth for emergency evacuation, indoor hose intervention unit for a computer graphics simulated living room fire and a Fire Brigade phone call centre.

This training centre played the core role for the study of behavioural change and comparison of trained and not trained children. At the same time, Turkish children are taken as a representatives of a typical developing country –preserving the vagueness introduced by developing country phenomena-.

As for the methodology,

- due to the diverse behaviour characters in young ages, the object age segment is taken from the second year to the fifth year of primary school, namely 8-11 years old children;
- a survey is made on the role given to children and response schema in developing countries like United States and Japan, which showed a considerable difference in attitude, while the methodology in making children to get acquainted with fire safety and fire response is much similar;
- a definition and behaviour character for a developing country children versus developed country children is developed, which is mainly based on cultural formation, behaviour and decision making rationale, in case of fire and haphazard situations;
- the outcomes have been crosschecked for their consistency with historical fire data and other behavioural schemas.

The observations, objective and comparative data to give a precise answer, or developing a behaviour model are not enough and complete yet. However, against all this uncertainty, study will be continued, to question the issue (i.e. the children behaviour patterns in and against fire) and to share the outcomes.

The object group of children has been narrowed, focusing in a defined boundary, since the children show considerable diversities. Our boundary is defined by :

- a) subjective and local issues, such as cultural barriers; which is expressed under a “developing country children” definition.
- b) objective issues, which is expressed under a “mobility and age” definition; where limited mobility and ages 0-7 and 11-16 were excluded.

## **4. DISCUSSION**

### **4.1 Children of Developing Countries**

Although, as a victim or exposition to fire hazard, there is not an appreciable difference between a developed country and developing country child, there is a considerable difference, in terms of safety concept, fire acquaintance, safety environment, education, training, social role, repetition and consistency aspects.

It is correct that even in developed countries, there is a fragment of children (expressed as low-income communities), sharing similar drawbacks of a developing country, developed country identity such as the environment, regulations, enforcement, consciousness, resources is still existing. Because, even the children of high-income communities of a developing country, cannot be taken similar to the high-income community of a developed country, since there are local and cultural macro behavioural patterns defining them as well, which cannot be overridden by socio-economical status.

Hence, a differentiation based on the socio-economical status is taken to be a correct basis, of course keeping in mind that all the developing countries cannot be taken identical.

The main characteristic of developing country children effective on fire safety attitude are, fragmented personality, lack of obedience to instructions, lack of commitment to the rules and regulations, over stimulated self-confidence, over-stimulated individualism, lack of team work and social awareness, passion for leadership, incompatibility in social action, superficiality in observation, lack of decision-making tools, lack of solidarity, socio-economic status, family, neighbourhood and communal culture, exposure to mass media (notably TV and newspapers), split identity, power-based relations, etc. Most important of them all is that, the fuzzy character of distribution of behaviours, mainly due to a non-homogenous and non-standard character of education and family life.

One may say that, these are valid for developed country children as well. However the main difference is in two aspects : “the strength and depth of problem is more in developing countries” and “in the developed countries there is a normalisation process, eliminating the diversities by education and social exposure”.

Another critical issue is that, all these behavioural properties are adversely effecting the fire safety awareness. For instance most of these behavioural properties are not adversely effecting the performance in sports; on the contrary, these contribute for a competitive performance. Life style, social framework, individual properties developed in a developing country is not offering fruitful grounds for building up a fire awareness and positive merits for behaviour in fire. Therefore, contributing and cooperative character is less in developing country children.

#### **4.2 Where and how to consider children ?**

In prescriptive approach, there are certain occupancies where children are primarily considered for maintaining life safety. Schools, kindergartens, educational facilities, etc. are such traditional occupancies, where focus is predominantly on the children and children safety. Whereas for the other occupancies, even where children presence is expected, but in a mixed occupancy schema with adults, the children are neglected and a special emphasis is not made on the issues to likely be effective in presence of children. Hotels, recreational facilities, shopping malls, etc. are the occupancies where a certain presence of children is expected, but a dedicated emphasis on the issue is not made. Whereas the occupancies like office buildings, conference halls, theatres, auditoriums, etc. children are taken to be less likely to be present, hence totally neglected.

The presupposition behind the occupancy-based approach is that, “when children are accompanied by an adult, children are no more a parameter, since the adult is expected to be capable of overcoming the problems to be likely faced together with a child or children”. Hence, in the mixed occupancies where there are children together with the presence of adults, this mixed group is reduced to adult behaviour.

However, the observations during the simulation and training for evacuation under smoke and manual fire intervention (using covers, portables or hoses) showed that both the adult and children behaviour and decision-making are effected drastically, depending on whether they are alone or not.

For evacuation under smoke, the vertical and horizontal travel speed, crawling ability, crawling method, back&forth proceed, physical touch and closeness, hot door check, face masking against smoke, communication, etc. are all effected when children are alone, when accompanied by parent(s), when accompanied by adult(s) who is not a parent. Hence age, health-physical condition, parentness/familiarity (e.g. teacher or neighbour), imparity of parent, adult/children ratio, travel distance, children and/or adult training/practice level, how much oneself is acquainted with survival techniques are the determining factors. Horizontal and vertical travel speeds are found to be a different functions, all in a discontinuous character, where for both, adult/children ratio is the primary parameter in evacuation, specially under smoke. This matrix of parameters needs to be implemented for each group, as well as mixed groups of children.

Another aspect, which is influenced by the presence of children, is manual intervention, normally to be handled by adults. The intervention speed, readiness of taking the risk, risking oneself, etc. are all effected, depending on the presence of children and how much they are exposed to risk, together with the number of adults per children. Hence adult/children ratio, this time in a continuous relation, is an important parameter for the efficacy of manual intervention. Manual intervention decision-making has to be implemented for each age, health-physical condition group, as well as mixed groups of the children, children and/or adult training level or how much oneself is acquainted with intervention techniques.

Whether it is correct to get the children involved actively with manual intervention is an ongoing debate. While an emergency based training do not get children actively involved with fire fighting, there is a tendency to get involved in disaster based training, with a self-help concept, self-sufficient concept. It is also observed that, developed countries are more reluctant to get children actively involved with manual fire intervention by compensating with technological measures (sprinkler protection, fire alarm reporting to the fire department, etc.), where developing country attitude is more towards self-sufficiency, because of lack of technological and infrastructure back-up. It is also worth mentioning that some of the training given is for the future risk exposures, but not valid for childhood. So in fact, although children are trained how manual intervention to be handled, they are not expected to do so, unless they become grown-up's. It is clear that this demarcation is a difficult methodological challenge. Here again adult/children ratio, age groups, imparity of adults, training level, standardisation of the fire fighting equipment are the key parameters.

Hence, both for the evacuation and manual intervention, it is resulted that the behaviour is in a matrix pattern. Again for both, making a quantitative analysis and developing numerical outputs were not possible, within the scope of this study.

Therefore, presence of children in human behaviour cannot only be considered to be expressed inherent to the occupancy, expressed by occupancy-based approach only. Unless the children as an occupant (adult/children ratio, parentness/familiarity, etc.) is limited based on the occupancy through operational means, children have to be considered to be present.

## **4.3 Response to Fire**

### **4.3.1 Panic**

The response patterns of children in full scale, actual fire situation are not available to drive exact conclusions. From research methodology aspect as well, there are substantial problems in forming a control group. It is even more difficult to arrive actual world data on the educated and non-educated children in a comparative manner. However due to a disaster experienced in Turkey, we have strong evidences (letters received after the Turkish earthquake dated Aug.17th, 1999) that educated children were calm, acted as they were thought and even led their parents correctly. Hence, we have positive evidences that proactive attitude, education and practicing is very effective for maintaining the rational behaviour or preventing “panic”.

### **4.3.2 Shelter versus Escape**

The actual fire reports, specially on residential fires show that, an untrained and unaccompanied child or children (specially siblings) prefer to stay in their most familiar location (sleeping room, parent’s room, etc.), thinking it to be the most secured place against the threat; drastically enough they may not well be the best place in terms of for fire safety. It is quite common, after a fire to find children dead, in their sleeping room or under their bed, alone or together with siblings, or together with a pet. Hence, in case of a fire “shelter” or “safe heaven” for children is the known, familiar place; not a protective place against fire.

Moreover, if not thought accordingly (which is not the case in developing countries) if the origin of fire is not before their eyes and if the smoke is coming from an unidentified source, the most common and expected behaviour is to stay and shelter, instead of attempting to escape. Again studying the actual fire reports, for an unaccompanied child or children, we observe that an escape venture is very unlikely to happen, unless they are called or trained to do so. The common practice is towards keeping the existing location, or more commonly, moving to a place which is familiar or more intimate, which makes to feel in a safe heaven and relieving at least for waiting somebody to come and rescue. Hence keeping the position in a shelter, rather than escape is the dominant behaviour. This confirms the fire fighters who tend to check the sleeping rooms first in a rescue operation.

Again the actual fire reports show that movement to a temporary shelter is not common in children behaviour, which can be seen in adult behaviour. Also, the response schema shows that, when unaccompanied, “pre-movement time” is not a parameter applicable for an uneducated child, due to shelter/escape dilemma.

### **4.3.3 Taking Belongings**

Caring and taking belongings during an emergency evacuation is a parameter to effect the evacuation performance. Especially in the hosting facilities like hotels, ships, temporary lodgings, it is an important parameter for adult behaviour, influencing the pre-movement and travel time. Whereas in children’s behaviour, care against the belongings is on the limits of a toy, a doll or a pet especially for the pre-school period. Although it effects the pre-movement period, the objects are not on the scale of impairing the movement. Meantime, adherence to a belonging is strong in the pre-school period and becomes less for upper age groups.

#### **4.3.5 Following the Signs**

The exit and directional signs are addressed to adults. An overhead location for such a sign is not appropriate for a child, whereas lower level installations are better for sight. The age group with an independent mobility (i.e. 3-13 years old) is not tall enough to grasp the overhead signs as effectively as adults. However, considering the evacuation by crawling under smoke, where adults have to crawl, most of the children do not have to, since they are not tall enough to catch the smoke layer. Hence their angle of sight to an exit or directional light becomes better than an adult.

#### **4.3.4 Crawling Under Smoke**

Crawling under smoke layer during an evacuation should be thought in a conceptual framework, so that the reason behind it to be known and applied when needed. Because when being well under the smoke, crawling is not necessary, but masking the mouth becomes more important. However, it should not be forgotten why the crawling technique is practiced to the children : that is for their future experience, when they are adults, i.e. when tall enough to be effected by the smoke layer. Hence, training has to emphasize the reasoning behind the crawling technique.

#### **4.4 Transformation Capability**

Human factor in fire safety should not be taken to be something permanent, unchangeable. Taking the whole course of life, it is important to know that the human factor has the potential to be transformed from a negative impact, to positive impact. This aspect is best observed with children. Children of 7-11 years old are best to be educated for fire safety awareness, rational decision-making, correct and rational behaviour in fire. Education becomes even more critical for developing countries; because the actual family life, school education, social environment, mass media do not furnish children with correct and compatible notion of safety, awareness concepts and survival techniques.

From the engineering design perspective, either prescriptive or performance based, one has to take into account, define and know the boundaries of, what we call human. We have a normalised conception of human, when we talk about. Therefore a “normal” have to be defined and more important, it must be attained. As a general or specific occupant segment, training is the key element. Hence, training and education have to be treated as a tool for normalising the human behaviour, where differences and diversities are minimized, in a pre-defined set of conditions. As mentioned before, in the developing countries, the diversities become deeper by growing age, hence training in 7-11 years old is found to be the best period for raising awareness, developing social and personal behaviour for fire safety and survival. Otherwise, in the later years, individualism, unobedience, high self-confidence, risking capability, incorrect rationality and misobservation take the control, while leaving a, difficult to shape human being.

### **5. CONCLUSION**

Any detailed approach, to gain maturity against occupancy classification which is based on prescriptive safety concept, must deeply involve with children behaviour pattern in fire, which is a crossroads with local, cultural aspects and objective, inherent human properties.

Once the empirical data is detailed and quantitative data is derived, the information can be used not only in developing performance-based design methods, but occupancy limitations, attended/unattended children safety policies, facility management policies will also be benefiting from the outcomes.

Again with this study, against a normalised and even totalised approach to human behaviour, an attempt to an object-based human behaviour is made; where two aspects, namely children and socio-cultural development status are considered together, with implications in recent fire engineering conceptions, basically in performance-based design of human related measures and systems, as well as human behaviour in fire.

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