*IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE)*
*e-ISSN: 2278-1684,p-ISSN: 2320-334X, Volume 12, Issue 2 Ver. III (Mar - Apr. 2015), PP 88-91*
*www.iosrjournals.org*

# Review Paper on Construction Defects

Miss. Neha.V.Bagdiya[1], Prof. Shruti Wadalkar[2]
[1,2,(]*Department of Civil Engineering, Pad. D.Y.P.I.E.T, Pune, India)*

***Abstract:*** *Construction defects are very common and frequently arising in construction project, especially in the project which has poor workmanship, poor project management in the construction site. Construction defect can be known as major problem in the construction industry that could cause the value of building decreases. As the defect impact on time and cost overrun, identification of defect at early stage of construction makes easy to complete project in stipulated timing. This helps to avoid or minimize defect in future work. Numerous analytical or statistical methods are available for analyzing impacts and selection of proper method depends upon: statistical data, time limitation of method. This information further helps to fix responsibilities, penalties on various parties involved in construction. This data is also required for suggesting different selection of remedial measures for improving useful life of structure. The purpose of this study is to review various symptoms & causes of construction defects occurring in construction project.*
***Keyword:*** *Building Defects, Construction defects.*

## I. Introduction

Construction defects are always the key concern of the construction industry. Different constructed facilities generate different types of defects and demands different levels and types of quality depending on the function, system, types and material used. Various systems have been designed to eliminate defects during construction operation.

Defect cost is defined as the value of resource expenditure for rework. Various factors are measured like rework time, materials and equipments to correct the defects. Time is lost in waiting as a consequence of defects. Defective building construction not only contributes to the final cost of the product but also to the cost of maintenance which can be considerable. The cost is calculated irrespective of who is going to pay. Defective construction may lead to complete failure of structure. The construction industry all around the world is getting modern, advance and growing day by day with the help of information technology age. Defects can affect success of construction project significantly. More specifically, it has major impact on construction cost, construction time, and productivity and sustainability aspects also on customer satisfaction

### 1.1 Defects:

Following are the consequences of defects;

- Dissatisfied Customer
- Extra cost borne by company
- Delay in completion
- Reduced Productivity.

This paper aims to contribute to knowledge of the defect profile of residential buildings regarding the defect number, type, location, severity and responsible trades. It also identifies various factors causing construction defects and hence to find justifying measures to reduce defects. Therefore, eliminating defects and maintaining good quality have an important cost benefit for the society. Although it may be predictable that defects in a building occur through general wear and tear, defects due to human errors in the construction of a home should be minimized.

The topic for paper work was selected with an intention that the findings from the literature review, questionnaire survey and case studies will provide a better solution for problems relating to defects in construction projects that established in the construction industry. Study was carried out through structured questionnaire focusing major parties i.e. technical persons, Labours, contractors, customer who buys constructed products etc.

### 1.2 Types of Defects

**Structural defect:**

Structural defect means any defect in a structural element of a building that is attributable to defective design, defective or faulty workmanship or defective material and sometimes any combination of these. Building structure includes earth retaining walls, columns, beams and flat slabs.

Structural defect can be categorized as cracks in foundations (Substructure), cracks in floor or slabs (superstructure), and cracks in walls (superstructure). These defects can be caused by improper soil analysis, inappropriate site selection, and the use of defective materials. Most of the structural problem can be avoided by implying the exact and detail of the design and planning. Structural defects in a building can occur over time due to deterioration, wear and tear, overloading, and poor maintenance. They must be repaired to maintain the building's structure and to prevent any further failures. Regular inspection is the key to protecting the 'health' of a building's structure. Structural defect that always occurs are steel corrosion, cracks, and deflection.

**Non-structural defect:**

A non-structural defect in a residential building is described as a defect in a non-structural element of the building as a result of defective residential building work. Non-structural defect includes defect occurs in the non-structural components of building, services like in brick work, dampness in old structures, and defects in plaster works.

## II. Literature Review

N. Ahzahar, N.A.Karim(2011) etc discussed Failures and defects are general phenomena in construction industry. Negative impacts may occur towards cost, duration and resources of project. Failures and defects can cause needless expenditure and delays. The aim was to identify contribution factors to building defect and failures, which frequently take place in construction project especially in Penang area in order to minimize time and cost involved. The data is collectively from questionnaire from various players in construction industry. This study is succeeds in identifying the common contribution factors of structural defects and failures in construction project

Josephson and Hammerlund's 1999 study of seven buildings through observation's and surveys showed that 32% of all defect costs originated from client and design. 45% from sit management and approximately 20% from materials and machines. Personal in the best position or prevent defects were directly contributing to the defects. Most of the defects due to human factors were caused solely by "Forgetfulness and carelessness".29% by lack of knowledge, and a very small percentage were intentional. Regarding design defects, 44% of defect costs were due to lack of knowledge and 50% to lack of motivation. As for workmanship defects, lack of motivation dominated the costs, but the presence of risks directly increases the chance of defects.58% of defects resulted from faulty design, 35% from operational and installation, 12% from poor materials, and systems, and 11% from unexpected users requirement.

Atkinson 2003 found that managerial errors accounted for more than 82% of all building defects and that these errors have hidden or latent characteristics, suggesting that such errors were not visible at the construction stage.

Anandet al. 2003 examined the resistance of newly developed masonry work to dampness and leakage and found that better design helped to prevent defects because it could eliminate workmanship defects.

Sunyoto and Minato 2003 identified inadequate information, unawareness, wrong assumptions, and lack of knowledge, along – side other organizational and motivational factor as contributory factors to defects at the design stage.

Wai-Kiong Chong,M.ASCE and Sui-Pheng Low discussed the differences among the defects that occurred during construction and 2 to 6 years after initial occupancy and finds that the defects at both periods were very different. Defects found during the occupancy stage are commonly known as latent defects, most of which were hardly ever found during the construction stage and are thus infrequently accounted for by the designers and building developers. The paper confirms the need to look at defects in another way and to establish more effective methods to reduce latent defects.

Seung Heon Han(2008) discussed many researchers and project managers have attempted to improve project performance by applying new philosophies such as lean principle, just-in-time, pull scheduling, and last planner. This research explores practical solutions for construction performance improvement by applying the six sigma principle. This theory provides the metrics required to establish performance improvement goals and a methodology for measuring and evaluating improvement.. Author focused on the development of the general methodology to apply the six sigma principles on construction operations relatively than construction materials in terms of the barometers to measure, evaluate, and improve construction performance.

A.S.Ali and K.H.Wen aimed to investigate workmanship quality performance of construction projects referring to number of defects take place for new completed building. The research objectives are the factors contribute to poor workmanship and probable measures to minimize the problem, and also the relationship between measures identified with the factors. Based on a combination of literature review and questionnaire surveys, this paper explores the factors contribute to poor workmanship and possible measures to minimize the problem, and also the relationship between measures identified with the factors. This paper concludes that construction projects suffered from low quality of workmanship created by the contractors. The most significant

factor contributing to poor workmanship is lack of experience and experience of labours. Correlation test result shows that the significant factor can be solved by providing training and education to the labours, well manpower management and proper design. To find out the factors contributing to poor workmanship and possible measures that can be implemented by contractors. This would help the contractors improve quality performance on their construction projects.

H.Aljassmi,J.Perera and S.Han studied on understanding defect causalities is indispensableto its prevention. This paper aims to identify the correlations and inter-causalities amongst the root causes of construction defects, so as to obtain insights about the complex mechanics of defect causation and help in developing effective defect prevention strategies. Data was collected through a questionnaire survey of 106 professionals in the construction industry. Correlations and inter-causalities analysis showed that time pressure, financial constraints and organizational culture were the most influential root causes. This paper aims to take out the major causes resulting in defects from extensive literature review; and subsequently conduct a survey with industry practitioners to confirm and revise the causes and then analyze their correlations and inter-causalities.

Nuria Forcada studied a total of 2,351 post-handover defects resulting from four Spanish builders and seven residential developments are classified according to their location, subcontract, and element. The research reveals that the most common defects identified by customers at handover were incomplete tile grouting and incorrect fixtures and fittings in toilets. In addition, failure to apply second coats of paint to walls was deemed a problematic issue. Typical surface/appearance defects were found to include floor or wall unevenness, stains, mess, and small cracks and marks, primarily caused by lack of protection. In areas where fixtures, fittings, and finishes were of a similar nature, such as the kitchen and bathroom, defect types also arose. Determining the location, subcontract, and element where defects occur in residential buildings can provide very useful knowledge about areas where builders are likely to make errors or mistakes or take deliberate shortcuts during construction.

## III. Conclusion

The main objective of this research is a preliminary examination of defect with respect to minimize the cost of construction and improve the quality of construction. Occurrences of defects in buildings lead to lowering the customer's satisfaction level, to stand and progress with increasing reputation in market, customer oriented construction of buildings needs to be constructed to improve quality and service to end users.. On the other hand, most important cause is poor workmanship, especially do not compliance with the instruction given in the specification is also responsible for the occurrence of defects. . Inspection of building is necessary at specific time interval throughout life of building.. The lack of maintenance or incorrect maintenance can reduce the effective life of a material, far lower than it should be achieved. This paper concentrated on defects occurs in construction project after hand over of project. Defect analysis is not so easy task but it is very important because the building service life and safety is always depends on the strength and durability of building components and that components are defect free ultimately we get the best service life and safety.

In that paper number of scientist says that the defects are increases the cost of construction and reduces the life of structure. The reason of defects are very common in everywhere i.e. workmanship, quality of material, lack of supervision wrong construction method, lack of inspection after construction etc.

## IV. Recommendations

**A) In the Design Phase**

1. Proper Production Management

- During design phase, architect should implement procedures that will subject the design to extensive review and analysis before it is released to construction.
- Involvement of design team members and subcontractors.
- Proper management of construction documents.
- Complete and well coordinated set of design development documents.

**2. Peer Review**

- Development of complete, accurate, well-coordinated design and construction documents that are internally consistent and contain all of the information necessary for the contractor to construct a building without design defects.
- where a new and/or innovative material and/ or system has been incorporated into the design and construction documents.

**3. Owner Involvement**

- The inevitable design changes and coordination that will occur throughout the design phase will be more effectively accomplished prior to the start of the construction documents phase.

**4. Design Schedule**
- avoid accelerated and/or shortened design phase.

**5. Design and Construction Coordination**
- architect and contractor should establish and maintain open lines of communication throughout the project.

6. Construction Manager's constructability review of the design and construction documents during the pre-construction phase of the project will help to minimize potential of design defects.

**B) Construction Phase**
1. 7eQuality Management implementation, by the contractor, of a comprehensive quality assurance ("QA") and quality control ("QC") program is critical throughout the construction phase of the project.

**2. New Building Technology**
- Contractor's work verification by the manufacturers' representative.
- Conduct in-depth inspections of the work by both the architect and the contractor.
- Use experience and trained workers.
- Use the same crew throughout the project.
- Require pre-certification and/or training of the workers by the manufacturer prior to the commencement of the project.
- Limit overtime and shift work where possible.

## References

[1]. Atkinson, G. _1987_. "A century of defects." Building, 54–55.
[2]. Cheetham, D. _1973_. "Defects in modern buildings." Building, 225.
[3]. Georgiou, J., Love, P. E. D., and Smith, J. _1999_. "A comparison of defects in houses constructed by owners and registered builders in the Australian State of Victoria." Manage. Int. Rev., 17_3_, 160–170.
[4]. Georgiou, J., Smith, J., and Love, P. E. D. _2000_. "A review of builderregistration in the State of Victoria, Australia." Struct Surv., 18_1_,38–45.
[5]. Georgiou, J., Smith, J., and Love, P. E. D. _2002a_. "Defects and quality control in the housing industry: Implications for management and regulatory control." Proc., 8th Int. Conf. on ISO 9000 & TQM
[6]. (Change Management) _CD-ROM_, Centre for Management Quality Research _CMQR_ at RMIT Univ., RMIT Storey Hall, Melbourne, Australia.
[7]. Georgiou, J., Smith, J., and Love, P. E. D. _2002b_. "Quality improvement through builder registration." Proc., 8th Int. Conf. on ISO 9000 & TQM (Change Management) _CD-ROM_, Centre for Management Quality Research _CMQR_ at RMIT Univ., RMIT Storey Hall, Melbourne, Australia.
[8]. Hammarlund, Y., and Josephson, P. E. _1991_. "Sources of quality failures in building." Proc., European Symp. on Management, Quality and Economics in Housing and Other Building Sectors, Lisbon, Portugal, 671–679.
[9]. Ilozor, B., Okoroh, M. I., and Egbu, C. E. _2004_. "Understanding residentialhouse defects in Australia from the State of Victoria." Build. Environ., 39, 327–337.
[10]. Josephson, P.-E., and Hammarlund, Y. _1996_. "The costs of defects in construction." The organisation and management of construction: Shaping theory and practice, D. D. Langford and A. Retik, eds., Vol. 2, 519–528.
[11]. Josephson, P.-E., and Hammarlund, Y. _1999_. "The causes and costs of defects in construction. A study of seven building projects." Autom. Constr., 8_6_, 681–642.
[12]. Josephson, P.-E., and Larsson, B. _2001_. "The role of early detection of human errors in building projects." Proc., CIB World Building Congress-Performance in the Product and Practice _CD-ROM_,Wellington Convention Centre, Wellington, New Zealand.
[13]. Knocke, J. _1992_. Post construction liability and insurance, E & FN Spon, London.
[14]. Love, P. E. D. _2002_. "Influence of project type and procurement method on rework costs in building construction projects." J. Constr. Eng. Manage., 128_1_, 18–29.