



Contents lists available at ScienceDirect

Materials Today: Proceedings

journal homepage: www.elsevier.com/locate/matpr

Material management and effective utilization of materials

R. Janani^a, A. Sankar^b^a Civil Engineering, Vels Institute of Science, Technology & Advanced Studies, Tamilnadu, India^b Construction Engineering and Management, Vels Institute of Science, Technology & Advanced Studies, Tamilnadu, India

ARTICLE INFO

Article history:

Received 15 July 2020

Accepted 1 September 2020

Available online 16 January 2021

Keywords:

Materials strategy

Management

Exploring waste

Minimization policy

ABSTRACT

Material management is the process of planning, organization and controlling the website online and office inside the occasions of construction. The major objective of fabric control is to ensure that construction substances are always available at their point of use when it is required to complete assignment on time. One of the major hassle in delaying production tasks is terrible material control.

The overall price of materials can be up to 60 to 65% or more of the total cost of production venture. Effective usage of materials and Effective fabric control is success key for Completion of Project on time with exact earnings. This will result in Eco friendly and sustainable environmental.

The Main scope of Material management is making plans, business enterprise and controlling. Planning consists of Estimation, budgeting Quality manipulate & Quality warranty and programming. Organization consists of Scheduling, Sourcing, procurement and delivering. Controlling consists of offloading, exceptional control & first-class take a look at, storing and Material managing.

© 2020 Elsevier Ltd. All rights reserved.

Selection and peer-review under responsibility of the scientific committee of the International Conference on Newer Trends and Innovation in Mechanical Engineering: Materials Science.

1. Introduction

1.1. Exploring waste minimization measures in construction projects

End of the Project 10 to 15% materials going for waste in construction nowadays. If we concentrate and workout on that in effective way, we can reduce the wastages and get more profit and save our environmental. We did survey and work with Labour and Foreman to understand the daily wastage of the project and end of the day we asked some questionnaires with various trade's Labour. We found the most common reason for waste is "Reworks." Reworks happened mainly due to Design changes, workmanship error, not followed as per approved drawing, incorrect material, wrong size, coordination issues between multiple trades, failed to follow the procedure and wrong understating of concept/drawing/details.

1.2. Effective use of materials strategy

End of this Survey we collected some notable observation from Labours/ Foreman and Engineers about Material management and Effective utilization of materials which are

1. Order the correct materials on time as per the project specification.
2. Have to get the Material approval from Consultant/Client through Material submittals based on Project specification before placing an order.
3. Once materials delivered to the site, Material Inspection (QA/QC & Consultant) should be done before commence work at site.
4. Proper Training to be obtained from Manufactures to the applicators/ Subcontractors/ Site Foreman/ Labours.
5. Have to use appropriate Tools and Equipment for the relevant task to avoid material damages and reworks.
6. Site As-built to be taken prior to fabricate the fit out materials including cove lights.
7. Experienced Survey team should be available at site and guide the site team.
8. Crosscheck or Joint survey to be done for all the subcontractor's RL/coordinates periodically and to be documented officially for future references.
9. Proper material storage to be provided under shaded area or to be protect from environmental.
10. Proper Storekeeper to be appointed and monitored each and every deliveries and to be entered through incoming/outgoing logs.

E-mail address: a.sankar.be@gmail.com (A. Sankar)<https://doi.org/10.1016/j.matpr.2020.09.022>

2214-7853/© 2020 Elsevier Ltd. All rights reserved.

Selection and peer-review under responsibility of the scientific committee of the International Conference on Newer Trends and Innovation in Mechanical Engineering: Materials Science.

11. Proper clearances to be obtained from MEP/façade/VT team before start with any civil works from to avoid reworks and material wastages.
12. All the subcontractors have to follow the Mani contractor's RL marking for their references.
13. Proper Rest area to be allocated for the Labour and Monitor their health and safety frequently
14. Proper Housekeeping to be done throughout the site by end of each shifts (day by day practice)
15. Proper training to be conducted for Labour/Charge hand/Foreman/Engineers from Sustainability team about Material management and Waste management/Waste segregation.
16. Fire auditing to be conducted periodically to avoid the Fire accident and material/property damages.
17. MSDS (Material Safety Data Sheet) to be addressed and followed for the Hazardous chemicals/Materials.
18. COSHH materials should be stored separately under proper signage and enclosed area.
19. Proper Fire fighting items should be provided around the storage areas.
20. Unauthorized person should not be allowed to enter the storage area.
21. Internal auditing should be conducted every month.
22. Proper lifting plan and approval to be obtained from lifting supervisor/Engineer prior to lifting heavy weight materials/equipment.
23. Third-party certificate to be obtained and proper history of maintenance record to be maintained for all type of lifting equipment prior to use at site.
24. Proper time space to be allocated for each task/activity and proper handover to be done prior to proceed with next activity.
25. Proper prior notification (30 days) should be issued for all the departments and subcontractors prior to demobilization of Tower crane, Hoist and other lifting equipment.

1.3. Scope of this research

1. .Cost Effective
2. .Reduce the development of waste and reuse
3. .On time Project finish
4. .Eco well-disposed and Sustainable Environmental

2. Literature review

2.1. Observation from the literature review

Khyomesh V. Patel (PG Student) Prof. Chetna M. Vyas (Ph.D. Cont.) To dealing with a gainful and cost proficient site effective material administration is basic. Research has indicated that development materials and gear may establish over 70% of the all-out expense for a run of the mill development venture. In this manner the best possible administration of this single biggest segment can improve the profitability and cost proficiency of a venture and help guarantee its convenient finish. One of the serious issues in deferring development ventures is poor materials and hardware the board. This paper portrays the primary aftereffects of review completed in Ahmedabad that researched the material administration of 3 notable developers of Ahmedabad.

There should be a centralized material management team co-ordination between the site and the organization. Proper control, tracking and monitoring of the system is required. Awareness and accountability should be created within the organization. There is a need of an efficient MIS integrating all aspects of material management. Firms employing proper material management system are seen to have increased their overall efficiency by 35%

Sohrab Donyavi and Roger Flanagan explains that little and medium estimated endeavors (SMEs) speak to an enormous piece of the development segment. Enormous organizations have the limit and capacity to utilize advanced data innovation and the board innovation to control the work and materials on ventures. SMEs need assistance to actualize control frameworks for work and material that will improve execution on location. The exploration includes examination of the effect of successful material administration for SMEs on building locales. Thought is given to materials' move through the store network up to establishment on location.

Materials can speak to up to 70% of the task development cost, thus any approaches to decrease wastage and improve profitability will have significant expense and time benefits. Good correspondence and coordination among the members is a decent method to defeat the hole between various gatherings and accomplish the general objectives of the task. Project coordinated effort apparatuses permit sharing of reports and records, likewise fitting and moderate innovation ought to be utilized to help with the better administration of materials through the request procedure up to putting nearby so new innovation, for example, web, RFID, GPS, following innovation, extranet are instrumental and reasonable in this procedure.

Kasim, Narimah attempted that development materials normally establish a significant bit of the all-out expense in a structure development venture. Materials the board is made risky by materials deficiencies, delays in supply, value variances, harm and wastage, and absence of extra room. In spite of the potential advantage of ICT, persuading development associations to grasp its utilization and execution has demonstrated a troublesome assignment. This investigation tries to distinguish the usage of ICT for materials the board forms in development ventures. The discoveries from the contextual analyses uncover that the usage of ICT in the materials the board forms for development extends in Malaysia is at beginning time. Microsoft Excel Spreadsheet and handheld gadgets are seen as the basic ICT devices received in the materials the board forms.

The primary boundary is seen as the cost contribution at the underlying stage or in general execution of ICT in the materials the board forms. At last, this paper finishes up the finding from interviews towards the ICT execution of materials the board in the development ventures. The primary instruments that are broadly embraced by the respondents are Microsoft Office and handheld gadgets, Bar coding and RFID.

Lenin, L.Krishnaraj, D.NarendraPrasad, Prasath establishes that the paper plans to fill a void made by the nonappearance of legitimate materials the board on building destinations. Research has indicated that development materials represents 50–60% of the absolute expense in development ventures. Material bungle decline the temporary worker's benefit prompting gigantic misfortunes, and leaving the task in huge difficulties, consequently the correct administration of this single biggest segment can improve the profitability and cost productivity of an undertaking and help guarantee its auspicious finish.

The examination was only evaluated through poll overview, interviews, field visits and conversation with the concerned specialists. 26 elements were chosen for the correct evaluation of most basic variables. The variables are positioned by the level of essentialness as evaluated by the respondents. The outcomes got from the positioning components shows that the main five significant's reasons for cost overwhelms are: plan issues, economic situation, store issues, temporary worker issues and outside issues.

Identifying factors affecting development time and cost overwhelms shows that, plan issues, customer issues, contractual worker issues, site issues, work and hardware issues, store issues,

outer issues, economic situation issues are answerable for cost invaded of building development ventures are depicted.

Rank of the top variables of every situation is recorded by methods for poll review. The outcomes got from the positioning examination shows that the followings, plan issues, economic situation issues as the major huge elements that causes the cost invades in development extends in India.

Pravin Khandve clearly said that in recent trends an extensive variety of building substances is to be had for the development of civil engineering systems. The total price of substances may be up to 60% or more of the full value incurred in construction mission structured upon the kind of project. Effective production materials management is a key to achievement for a creation venture. Construction waste is any other extreme trouble in production industry.

A huge and numerous kinds of construction waste with unique characteristics are created at all the tiers of construction. Construction industries have a bigger component in contributing environmental problems. The economic and environmental blessings ought to be won from construction waste minimization. This paper offers an evaluation on systematic research of the control of construction substances and creation waste, fabric management techniques, management of creation waste and existing situation of production control and construction waste inside the industry.

Narimah Kasim explained that materials control is made difficult via materials shortages, delays in delivery, charge fluctuations, damage and wastage, and shortage of storage space. Paper-primarily based reports are generally used to record and trade records related to the substances element within a delivery chain, that is elaborate, errors-inclined, and inefficient. Generally, emerging technology (inclusive of wi-fi machine, RFID) are not being thoroughly used to overcome human mistakes and are not properly integrated with project management systems to make the tracking and management of materials easier and quicker.

Thus, this paper reports on the early ranges of research which is growing a brand new ICT-primarily based technique to dealing with materials on construction initiatives. As a precursor to this work a literature evaluation on substances management system inside the production projects was carried out. This became accompanied via exploring the ICT gear and strategies presently being hired on creation tasks. The findings from literature assessment reveal the want for extra sophisticated materials management answer with the intention to improve tracking of substances efficiently. In end, the paper indicates regions in which additional programs would possibly further decorate the management of materials particularly tracking of materials on production tasks.

1. It is without a doubt important to manage all materials from design stage to the development level. Poor managing of production substances influences the overall performance of production projects in phrases of time, finances (cost), first-rate and productiveness.
2. The wastage of materials must also be minimized at some stage in creation as a way to avoid loss of income for production businesses. There is a need to increase new techniques to materials control in production initiatives in order to enhance the efficacy of the manufacturing manner.
3. The potential of ICT packages presents a basis for developing an powerful framework to support the improvement of substances management on construction initiatives. The next degree of this research will have a look at the extent and nature of automation of the substances management system and will develop new ICT-enabled tactics to enhancing substances management practices.

Lalitha Priya, Rathina Kumar, Prasanna Kumar, Ravekumar found out that the research has proven that the development substances account for more than 55%-60% of the whole expenditure of an assignment. Efficient cloth making plans plays a prime position in the hit turning in of a mission inside the anticipated cost and agenda. The aftereffect of the S-bend investigation show that the genuine materials cost is higher than the planned materials cost as a rule.

ABC and EOQ examination are applied to keep up adequate stock in stock and any given purpose of time, to protect the materials in the stock against harms, to diminish stock holding costs, to conquer stock-out issues and to maintain the stock in an ideal level. Affectability check is applied to the consequences of EOQ examination. The stock-out of A class and B class material issues looked in the building site can be diminished by the utilization of ABC order and BOQ examination. The total use of stock is less after the reception of these basic stock control procedures.

Rather than utilizing costly software for stock administration, the specialists and temporary workers may utilize these straightforward stock control methods which are equally beneficial and prudent.

Bamidele Temitope Arijeloye and Festus Olushola Akinradewo explained that the control of materials on building locales is dealt with heedlessly by arranging and buying offices, site chiefs and specialists just as temporary worker's association and this have been presenting different issues to contractual workers in acknowledging sensible overall revenue. The examination focused on the appraisal of materials the executives on building ventures in Ondo-State Nigeria. This examination evaluated the present acts of overseeing materials on building ventures, the issues related with materials the executives and measures for overseeing materials in building ventures in Ondo state. The investigation was brought out through the organization of poll to experts in both counseling and contracting firms and information gathered were broke down utilizing percentile and mean thing score.

The examination uncovers that buying of materials, material arranging strategy and transportation of materials are the most widely recognized acts of materials Management. The most serious issue militating against materials the executives was absence of legitimate work arranging and booking while different issues incorporate deficient income to contractual workers because of postponed installments, thievery, robbery and vandalism. The examination suggests that administration ought to improve their supervision on location, materials ought to be satisfactorily dealt with when conveyed, care ought to be given to materials taking care of procedure and more mindfulness ought to be given to the information on materials the board on building ventures.

Saheed O. Ajayi, Lukumon Ooyed, Muhammed Bilal said that in this paper, Mixed strategies method which entails area take a look at and survey research have been decided through the usage of statistics gathered. After series of data's, data are carried out through kruskal-wallis check facts and exploratory element evaluation.

The waste technology may be reduced handiest by using:

1. Right drawings
2. No layout modifications at some point of development
3. Maximization of on-website reuse of substances
4. effective logistics control
5. waste segregation

The effective management is the main element to minimize the waste. Contractors terrible information and placement managers lack of understanding also are cause for waste generation in site. Preventing double handling of substances, knowledge of design

and documentation can minimize the waste generated (Fig. 1. Fig. 2. Fig. 3. Fig. 4. Fig. 5. Fig. 6. Fig. 7. Fig. 8. Fig. 9. Fig. 10. Fig. 11. Fig. 12. Fig. 13. Fig. 14. Fig. 15. Fig. 16. Fig. 17. Fig. 18. Fig. 19. Fig. 20. Fig. 21).

Oyeshola Femi Kofoworola, Shabbir H. Gheewalasaid investigation analyzes development squander age and the executives in Thailand. Estimated somewhere in the range of 2002 and 2005, an avg of 1.1 million tons of development squander was produced every year in Thailand. This establishes about 7.7% of the aggregate sum of waste arranged in the two landfills and open dumpsites every year during a similar period.

Build up a manageable development industry in Thailand, the Integrated National Squander Management plan must be completely actualized together with measures that energize the recuperation and reusing of development squander. This assists with accomplishing potential to make occupations and furthermore lessen vitality utilization in the nation. One of the key constraints to this examination was the absence of development and destruction squander information.

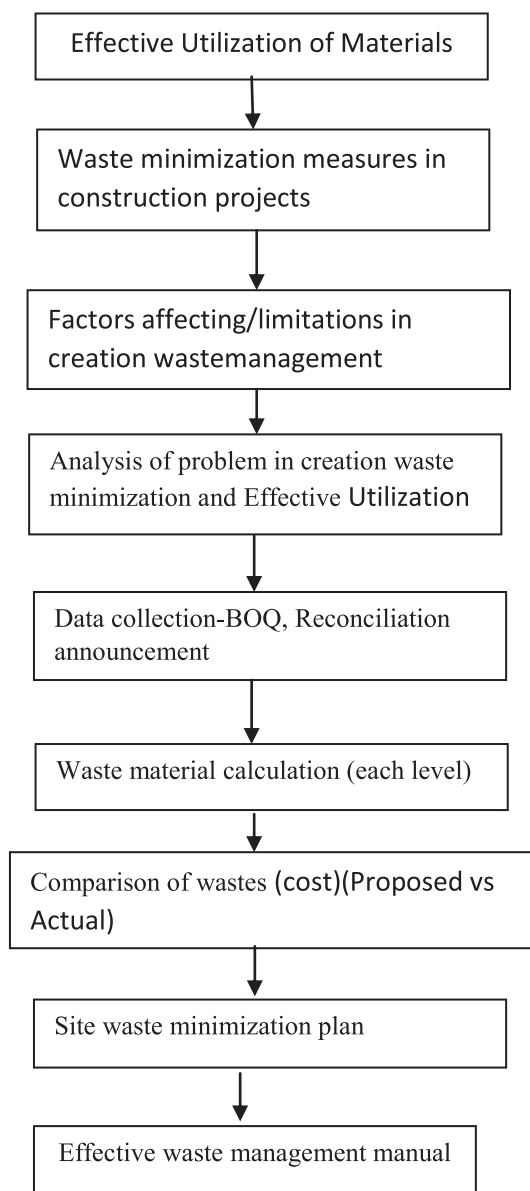


Fig. 1. Methodology.

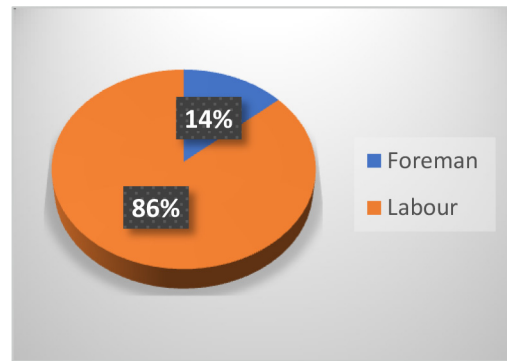


Fig. 2. Respondent position in the company: Labours/Foreman (22 responses).

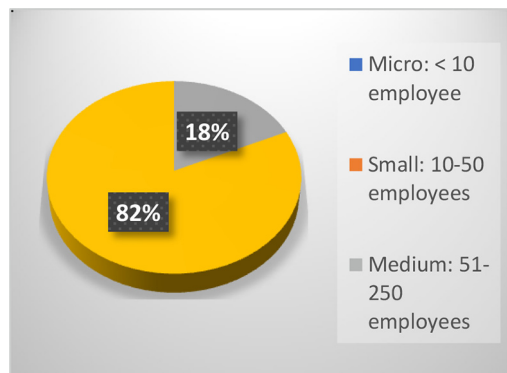


Fig. 3. What is the size of your company?

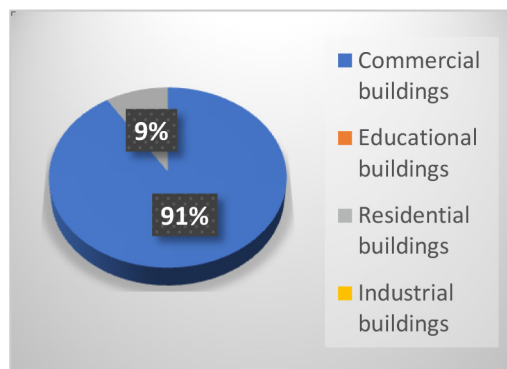


Fig. 4. What is the current type of your project?

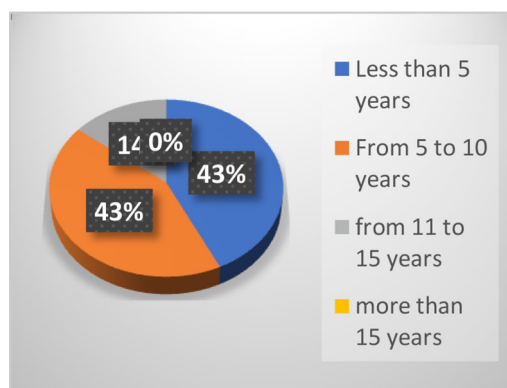


Fig. 5. Respondent year of experience in the construction industry.

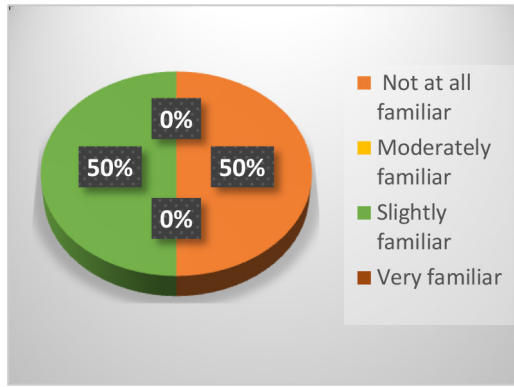


Fig. 6. Are you familiar with the term sustainable construction?

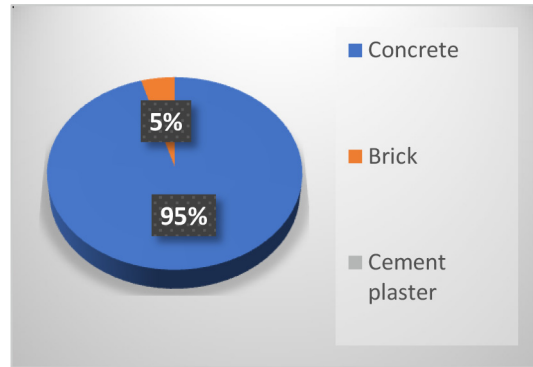


Fig. 9. Which of the materials used is greatly wasted?

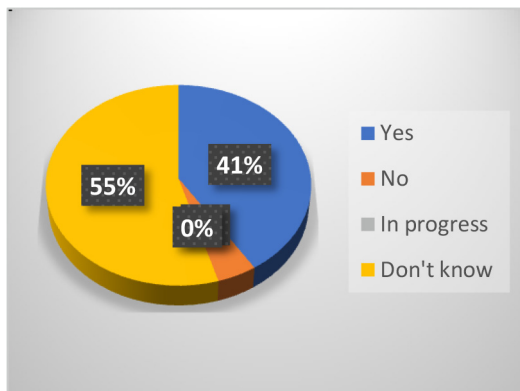


Fig. 7. Does your company have a construction waste minimization policy for its projects?

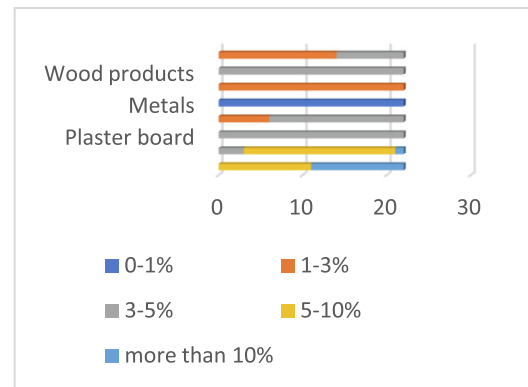


Fig. 10. As per your experience, what do you think are the percentages of the following wastes generated?

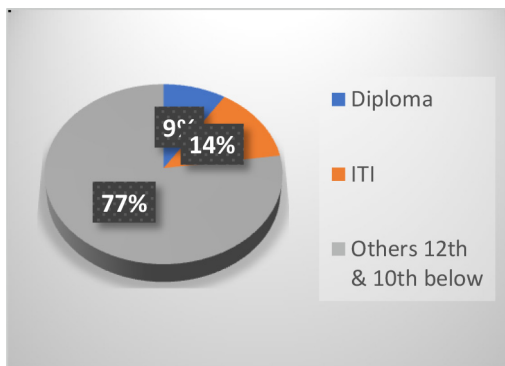


Fig. 8. Respondent qualification?

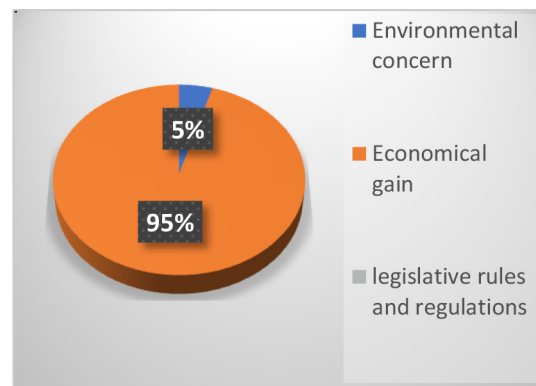


Fig. 11. What do you think is the most important factor to minimize construction waste?

3. Material and sources

3.1. Introduction

This study goes to be performed following deliberate set up that gives direction to hunt down the solution of the study queries. All required information and knowledge can be obtained via a well-prepared set up or technique that outlines various degrees in assembling data and know-how.

1. Usually a examine methodology is deliberate by level in keeping with their priorities perform and overall performance and characteristic so as to assure the effectiveness of the work.

2. The Stage by means of stage waste calculation of materials is calculated from the Site and thru Reconciliation statement.
3. Then, Questionnaire Survey is performed over the operating specialists and also with the labours.
4. Consolidation of facts from engineers/labours feedback with the scores.
5. Suggestions & Recommendations for the effective waste control.
6. Manual and Waste control plan is subsequently to be organized

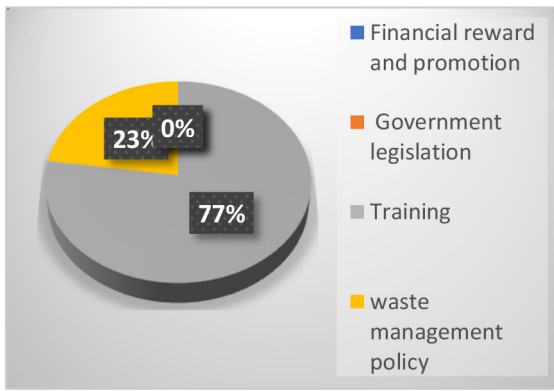


Fig. 12. What do you think is the most important incentive to help reduce waste in construction projects?

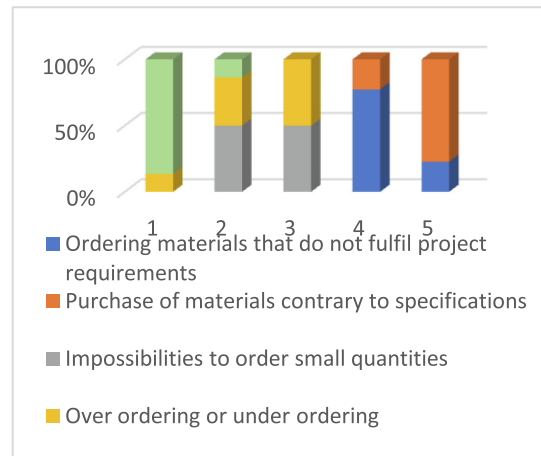


Fig. 15. Material procurement.

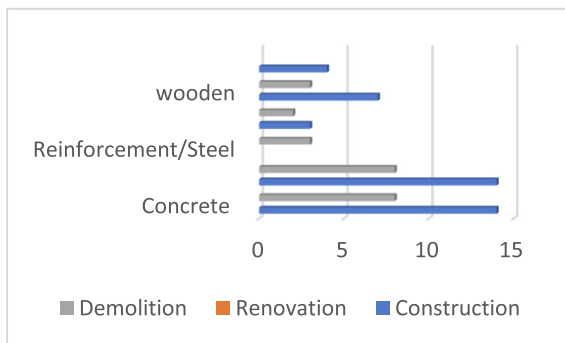


Fig. 13. State any three wastes that are maximally generated from any one of the above sources of construction, renovation or demolition?

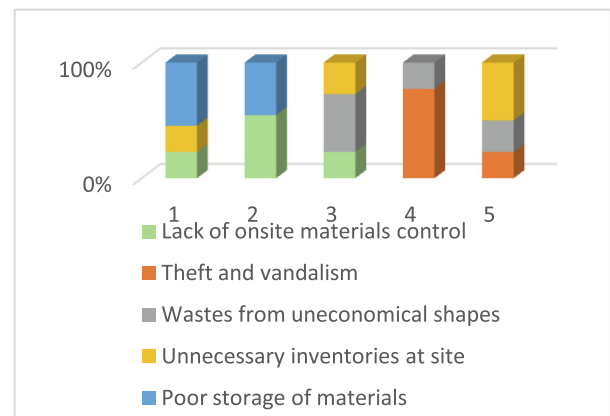


Fig. 16. Material management at site.

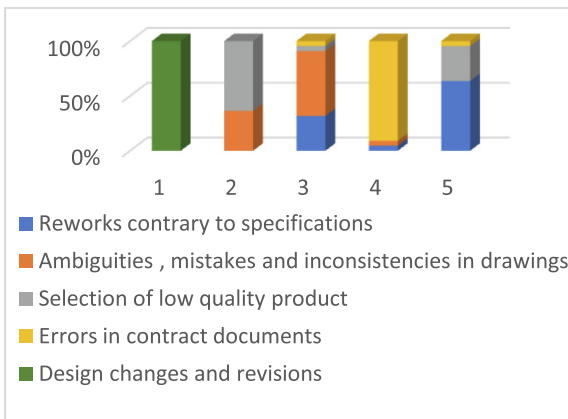


Fig. 14. Design and documentation.

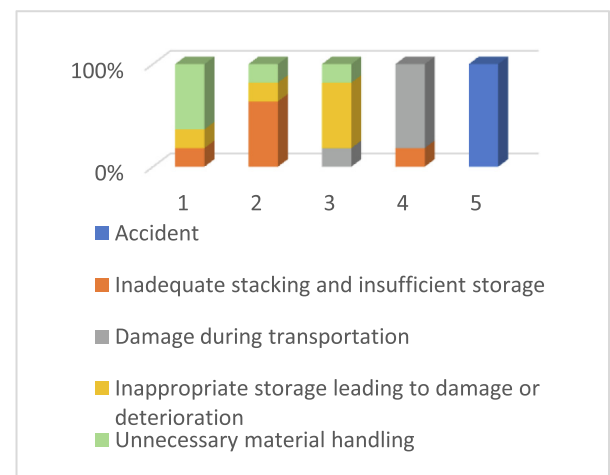


Fig. 17. Materials handling, storage and transportation.

4. Result and discussion

Exploring waste minimization measures in construction projects

Purpose of the survey: This questionnaire is part of study aimed at exploring waste minimization measures in construction projects

5. Conclusions

1. It is very clear to manage all the Materials from design stage to site execution.

2. All the design changes/variation order to be addressed in early stages before commence any works and should be coordinated with all trades.
3. The wastage of materials should be reduced, reused and recycled during construction stages.

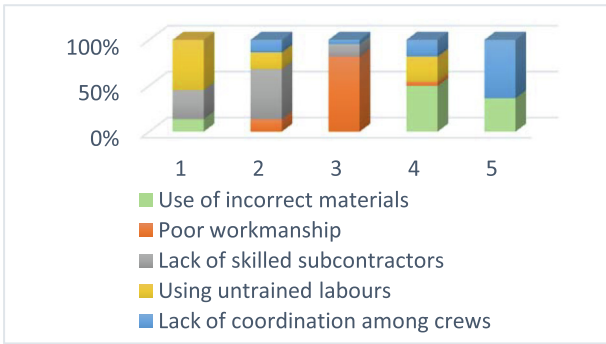


Fig. 18. On-Site operations.

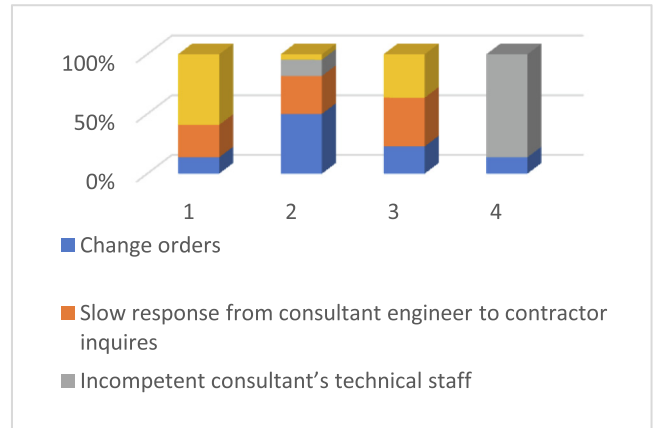


Fig. 21. Site supervision.

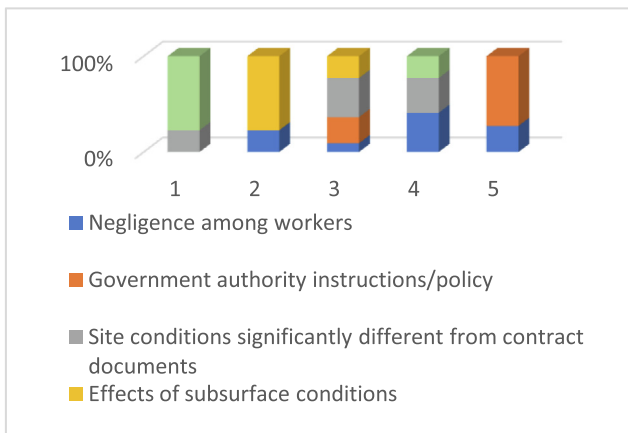


Fig. 19. Environmental conditions.

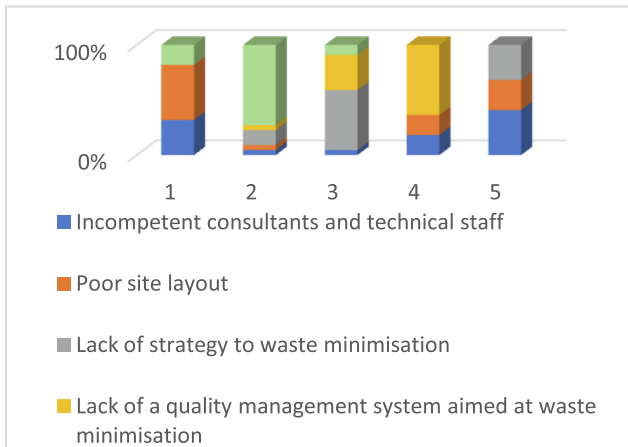


Fig. 20. Site management and practices.

4. Proper team coordination is good way to defeat the gap between multiple trades and leads to complete the project on time with profit.

5. Proper training to be conducted for Site teams about Material management, effective utilization of materials, Waste segregation and Sustainability development.
6. Completion of the project within agreed time frame is consider one of the critical factors and it can be done through only effective utilization of materials and proper material management.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Further Reading

- [1] CONSTRUCTION MATERIALS MANAGEMENT ON PROJECT SITES -Khyomesh V. Patel (PG Student) Prof. Chetna M. Vyas (Ph.D. Cont.)
- [2] The impact of effective material management on construction site performance for small and medium sized construction enterprises.-SohrabDonyavi and Roger Flanagan.
- [3] ICT Implementation for Materials Management in Construction Projects: Case Studies - Kasim, Narimah.
- [4] Analysis of Improper Material Management Affecting Cost in Construction Projects - P.Lenin ,L.Krishnaraj , D.Narendra Prasad, Prasath.
- [5] Management for Construction Materials and Control of Construction Waste in Construction Industry - Pravinkhandve.
- [6] Improving materials management practices in construction projects - NarimahKasim.
- [7] Construction Material Management through Inventory Control Technique - LalithaPriya, RathinaKumar, Prasanna kumar, Ravekumar.
- [8] Assessment of materials management on building projects in Ondo State, Nigeria -Bamidele Temitope Arijeloye and Festus Olushola Akinradewo.
- [9] R. Janani, P.R. Kalyana Chakravarthy, T. Ilango, Budget houses for low-income people, *Int. J. Mech. Eng. Technol. (IJMET)* 9 (13) (2018) 109–117.
- [10] P.R. Kalyana Chakravarthy, T. Ilango, S. Chezhiyan A detailed study on the mechanical and durability properties of hybrid fibre reinforced concrete. *Mater. Today Proc.* issue 21 2020 pg- 684–689.
- [11] Effects of Materials Management on the Productivity of an Organisation -Dr. Cross Ogohi Daniel.
- [12] P.R. Kalyana Chakravarthy, R. Rathan Raj Analysis on compressive strength of concrete with partial replacement of cement with alccofine ARP*N J. Eng. Appl. Sci.*, Vol -12 Issue 8 2017 2392–2395.