DEMOLITION- A SUSTAINABLE OVERVIEW

Submitted By

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DECLARATION

The dissertation entitled "**Demolition-A sustainable overview"** has been performed under the supervision of **Ms. Mardia Mumtaz** (Lecturer) Department of civil Engineering, Daffodil International University, Dhaka, Bangladesh, and got the permission in partial completion ofthe requirement for the Bachelor of Science in Civil Engineering. This thesis has not been written on, or copied from, any previously published knowledge and has not been written on behalf of others.

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ABSTRACT

Demolition of buildings involves the systematic dismantling or destruction of structures, typically to make way for new construction, redevelopment or safety reasons .The process vary in complexity and methods based on factors such building size, materials and surrounding Environment.

This paper presents a comprehensive overview of the multifaceted aspects of demolition, covering a spectrum of tropics critical to the effective and sustainable execution of demolition projects. It explores various demolition techniques, ranging from traditional methods such as Manual deconstruction to advanced technologies like robotic demolition and implosion. Safety Management practices are examined in-depth, emphasizing, importance of stringent protocols. And cutting-edge technologies to safeguard both workers and the surrounding environment. Cost factors associated with demolition projects are scrutinized, offering insights into the economic consideration that influence decision-making. The study also focuses on the increasingemphasis on recycling and reuse in demolition, with an emphasis on waste reduction through deconstruction processes. The paper examines innovative practice and technologies that contribute to sustainability, emphasizing the role of the construction industry in environmental responsibility. Technological advancement in demolition machinery, automation, and real-time monitoring are discussed, showcasing how these innovations enhance efficiency and safety. The integration of building information modeling and other digital tools for demolition planning and execution is also explored. Furthermore, the paper investigate the role of community engagement in demolition projects, collaboration, and addressing community concerns. It highlights the need for a holistic approach that incorporates the perspectives of residents and stakeholders to achieve successful and socially responsible demolition outcomes.

In summary, this overview provides a comprehensive understanding of demolition processes, techniques, safety management, cost consideration, recycling, reuse, technological advancement, and the pivotal role of community engagement in fostering sustainable demolition practice.

Keywords: Demolition processes, techniques, safety management, cost consideration, recycling,reuse, technological advance

CHAPTER 1 INTRODUCTION

1.1 General

Demolition is the controlled and systematic process of dismantling removing or destroying structures, buildings or infrastructure. It is a crucial aspects of construction and urban development, enabling the removal of outdated or unsafe structures, making space, for new construction, renovation, or repurposing of land. Demolition projects vary widely in scale, complexity, and purpose, ranging from small residential demolition to large scale industrial or commercial projects. Several key aspects characterize the field of demolition are the Techniques and methods, safety management, cost factors, recycling, reuse, waste reduction through deconstruction, technological advancement, community engagement.

1.2 Background of the study

1. Historical evolution of demolition:

Demolition practices have evolved significantly throughout history. Early methods involved manual labor and simple tools. The introduction of explosives in 20th century revolutionized the field with controlled demolitions. Studying this evolution provides insights into the technologicalAdvancement that shaped modern demolition practice.

2. Urbanization and the need for demolition:

The rapid place of urbanization, particularly in the 20th and 21st centuries, has led to increased demand for demolition as cities evolve and adapt. Understanding the correlation between urban growth and necessity for demolition sheds light on the integral role it plays in shaping modern cityscapes.

3. Regulatory frameworks and safety standards:

As the construction industry expanded the need for standardized safety measures and regulationsbecame evident. Investigation the development of safety standards for demolition provides context for the current emphasis on worker safety, environmental protection, and community welfare.

4. Environmental implication of conventional demolition:

Traditional demolition methods often result in significant environmental consequences, such as waste generation, air pollution, and soil contamination. Studying the environmental impacts of conventional demolition practice scores the urgency to adopt sustainable and eco-friendly approaches.

5. Technological innovation in demolition:

The integration of technology has transformed demolition practices. Robotics, advanced machinery, and building information modeling have enhanced safety, precision and efficiency. Investigating these technological innovation provides insight into the ongoing modernization of the demolition industry.

6. Sustainable demolition practices:

With an increasing focus on sustainability, researchers are exploring eco-friendly demolition methods. Deconstruction salvage, and recycling strategies aim to minimize waste and reduce the environmental footprint. Examining these sustainable practices provides a glimpse into the future Direction of the demolition industry.

7. Economic considerations and cost analysis:

The economic aspects of demolition, including cost analysis and financial implications, are crucial factors in decision-making. Studying the economic considerations provides a comprehensive understanding of the financial challenges and opportunities associated with demolition projects.

8. Community engagement and social impacts:

Demolition projects often have significant social and community implications. Understanding the impact on local community, addressing concernsand involving stakeholders in the decision-making process contribute to responsible and community-centric demolition practices in techniques, safety measures, and environmental consideration. In summary, the background studies on overviewing demolition encompass adiverse range of historical, technological, Environmental, and socio-economic aspects. This multidimensional approach provides a holistic understanding of the demolition industry, paving the way for informed decision-making, innovative solutions, and sustainable practices.

1.3 Scope of the study

1. Demolition techniques:

Comprehensive analysis of traditional and modern demolition techniques, including implosion, mechanical demolition, and deconstruction.

2. Environmental impacts assessment:

In-depth examination of the environmental consequences of demolition practices, with a focus on waste management, air quality, and soil contamination.

3. Safety management in demolition:

Evaluation of safety protocols, risk assessment methodologies, and the integration of technology to enhance safety in demolition projects.

4. Economic analysis:

Cost breakdown and analysis of demolition projects, considering factors such as labor, equipment,permits, and waste disposal, to identify cost-effective practice.

5. Technological innovation:

Exploration of emerging technologies shaping the demolition industry, including robotics,advanced machinery, and the use of digital tools.

6. Community engagement and social impacts:

Investigation of community relations stakeholder involvement, and strategies for minimizing disruptions during demolition activities. Global perspective: Comparative study of demolition practice across different regions, providing insight into cultural, regulatory and economic influence on the industry. The study aims to provide a comprehensive overview of demolition, fostering a deeper understanding of its multifaceted nature and contributing to informed decision making within the industry.

7. Regulatory frame works and legal consideration:

- Review laws, regulations, and policies governing demolition activities at local, national, andinternational levels.
- Analyze the role of government agencies, industry standards, and stakeholders in shapingdemolition practices and regulations.
- Examine legal challenges, liability issues, and ethical considerations associated with demolitionprojects.

8. Case studies and best practices:

- Explore case studies of notable demolition projects from around the world, highlightingsuccesses, challenges, and lessons learned.
- Identify best practices in demolition planning, execution, and post-demolition site management. Extract insights from successful demolition projects to inform future practices and policies.
- By delving into these aspects, this study aims to provide a comprehensive overview of demolition, offering insights into its historical roots, current practices, environmental and social impacts, regulatory framework, best practices, and future directions.

1.4 Objectives

1. Examine safety protocols and risk management:

Investigate safety measures and protocols in demolition activities, with a focus on risk assessment, hazard identification, and the integration of technology to enhance worker safety and public protection.

2. Explore the economic considerations of demolition:

Conduct a comprehensive cost analysis of demolition projects, examining factors such as labor,Equipment, permits, and waste disposal costs to understand the economic implication and identify cost-effective practices.

3. Investigate technological innovation in demolition:

Explore cutting- edge technologies, such as robotics, advanced machinery, Building information modeling, to understand their impact on improving efficiency, precision, and safety in demolition processes.

4. Recycle and reuse of demolition waste:

Recycle and reuse of demolition can significantly contribute to sustainability and environmental conservation. Here are some key components to maximize the recycle and reuse of demolition waste.

CHAPTER 2 LITERATURE REVIEW

2.1 Introduction

The demolition industry plays a pivotal role in the modern construction landscape, facilitatingurban renewal, infrastructure development, and sustainable development projects. As citiesevolve and grow, the need for demolition becomes increasingly prevalent, whether to remove outdated structures, clear space for new developments or enhance safety and environmentalstandards. This chapter provides a comprehensive overview of the literature surrounding demolition practices, methodologies, and implication by examining existing research, theories, And case studies. This chapter aims to elucidate the various facets of demolition, including its historical context, technological advancement, environmental consideration, recycle and reuse.Understanding the breadth and depth of literature in this field is crucial for informing effective demolition strategies, promoting safety protocol, waste reduction, and fostering urbandevelopment. Through synthesizing existing knowledge, this chapter sets the foundation for thesubsequent discussions on best practice.

2.2 Previous studies

Per the author- Rickard Andersson, Martine Buser and Petra Bosch et, ai.-(2018) The research employs the theory of institutional work, focusing on creation, maintenance, and disruptionconcepts, to assess actions within demolition companies regarding the stability of current practices and potential barriers to change. It highlights that institutional work operates similarly across creation, maintenance, and disruption processes, with creation and disruption necessitating the destabilization of existing institutions to enable new ones. Within maintenance, 'status quo' arguments are collected, reinforcing existing barriers and preventing change. In the creation category, arguments advocate for changes aligned with guidelines and circular economy principles, assuming their feasible implementation. Disruption arguments critique both creation and maintenance strategies, rejecting their assumptions and proposing a new paradigm for achieving sustainability in Renovation Waste Management (RDWM). The construction sector is urged to embrace its responsibility for sustainable goals. The next research phase involves studying actors' daily activities to understand how they shape their institutional context.

Per the author-Maria Menegaki, Dimitris Damigos, et, ai.- (2019) This paper conducts a recent literature review focusing on the factors, barriers, and motivations influencing the generation and management of construction and demolition waste (CDW). It highlights that globally,approximately 35% of CDW is sent to landfills without further treatment, despite increasing efforts for recycling.
and reuse. The study calculates two indicators for selected countries and develops an

explanatory model to understand the factors affecting CDW generation. Additionally, it constructs a concept map with thirty-six nodes representing components of the CDW system and their interrelationships. Overall, the paper aims to provide insights into CDW management. And offer strategies for improving waste reduction and recycling efforts in the construction and demolition sector.

Per the author- Xavier Duran , Helena Lenihan , Bernadette O'Regan, et, ai.- (2017) This paper focuses on the recycling of construction and demolition waste (C&DW), particularly in Ireland, where a significant portion of waste, including materials like concrete and bricks, is currently disposed of in landfills due to the lack of markets for recycled materials. The study develops a model to assess the economic feasibility of establishing markets for recycled C&DW. It considersthe decisions faced by waste producers and aggregate users, and examines the impact of environmental taxes and subsidies on C&DW recycling economics. The paper proposes theestablishment of three potential recycling centers in Dublin, Limerick, and a mobile unit. It concludes that economic viability is likely when landfilling costs exceed recycling costs, and when the cost of using primary aggregates exceeds that of using recycled aggregates. Furthermore, the study indicates that recycling centers benefit from economies of scale, with larger centers experiencing lower recycling costs. The paper suggests that market-based instruments are the most effective option for policymakers. The model is validated using real dataobtained from surveys with Irish local authorities responsible for waste management.

Per the author- Petri Sormunen, Timo Kärki, et,ai.- (2019) Although the reuse of demolition wastes has been studied in recent years, their reuse in composites has not been thoroughly examined. This study aims to provide a comprehensive literature review pertaining to the possibilities of using recycled construction and demolition waste in composite manufacturing. This study is focused on investigating the use of recycled wood, paper, cardboard, metal, glass, mineral wool, gypsum, concrete, and ceramics as raw components for composite materials. The composition, contamination, degradation, and recycling of construction materials is discussed to explain potential challenges for composite material manufacturers. Most of the research relating to recycled construction and demolition materials have been conducted on thermoplastics combined with cellulose-based fibers. However, mineral wool and gypsum have also been utilized. The use of recycled materials as matrix, filler, or fiber tends to result in the production of materials with weaker mechanical properties compared with virgin materials. Entities who utilize construction and demolition waste should take into consideration possible contaminations so as to prevent the spread of harmful substances. Because investigations on the economics, carbon footprint, and practicality of production have been scarce, definitive conclusions on the potential.

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generation methodology, particularly in contexts with erratic data availability.

Per the author- Angelo De Luca John Holland, Melbourne, Linda Chen Lendlease, and Koorosh Gharehbaghi, et,ai.- (2021) This paper aims to advocate for the sustainable use of recycled aggregates in construction projects. It reviews and discusses robust strategies for reducing construction and demolition waste, comparing the structural and mechanical properties of recycled aggregates to virgin aggregates and new concrete. The paper concludes that recycling concrete aggregate offers significant benefits, providing comparable performance to naturally mined aggregate while offering environmental and financial advantages. Although concrete recycling is not new, there remain barriers to effective recycling and reuse. Many companies are investing in research and development in this field, promoting the use of recycled concrete (RC) products in various applications such as road aggregates, structural elements, and precast panels. The paper recommends that governments implement construction and demolition recycling schemes with minimum recycling targets, tied to building permit approvals. Furthermore, it suggests that construction management plans should prioritize waste reduction strategies. Given the high volume of waste generated by the construction and demolition industry, governments should invest in developing robust waste reduction strategies. Recycled aggregates can play a significant role in supporting these efforts. Government incentives for innovative recycling practices could further alleviate construction and demolition waste concerns, raising awareness and encouraging similar practices across industries.

Per the author- Jongsung Won a , Jack C.P. Cheng, et,ai.-(2022) This paper addresses the significant challenge of construction and demolition (C&D) waste generation by identifying limitations in current waste management and minimization practices. Despite numerous studies, several process-related and technology-related limitations persist. The paper suggests that Building Information Modeling (BIM) can offer opportunities for more efficient C&D waste management and minimization by enhancing processes and technologies throughout the project lifecycle. Specific opportunities include design review, 3D coordination, quantity take-off, phase planning, site utilization planning, construction system design, digital fabrication, and 3D control and planning. Through a comprehensive literature review, the paper discusses how BIM-based approaches can address existing limitations in C&D waste management and minimization. Additionally, it outlines the roles of project participants and the necessary information for implementing each BIM-based approach, accompanied by illustrative process maps.

Per the author-André Coelho, et,ai.-(2017) Studies on selective demolition (also named deconstruction) in the past few years have produced some high quality economic, material and environmental information. Economic data, however, varies considerably between regions since local conditions strongly influence labour costs, tipping fees and/or market prices for recovered materials. Regional financial and regulatory constraints will bind the economic viability of conventional and selective demolition choices, which are essentially economic in a free market. Given this, the present study evaluates the economic implications of the two demolition types by analyzing a case study in Portugal. A few scenarios are considered, based on possible waste management options, some of which favour selective demolition over the conventional type.

2.3 Summary

It provides a comprehensive examination of the demolition industry, encompassing its historicalroots, technological advancement, environmental considerations, socio-economic impacts.Through a thorough analysis of existing research, theories, and case studies. The chapterhighlights the importance of understanding and addressing the multifaceted aspects of demolition By synthesizing diverse perspectives from academic studies, industry reports, and practicalexperiences, the chapter lays the groundwork for further discussion on effective demolition strategies, safety protocols, Environmental sustainability measures, and the promotion ofresponsible urban development practices. This summary encapsulates the essential findings and insight gleaned from the literature, setting the stage for deeper exploration in subsequent chapters

CHAPTER 3 METHODOLOGY

3.1 Introduction

Commonly the reasons for putting down a building are usually when the building life span is overor building has become a hazard and dangerous to be used as it may collapse, another common reason for demolition of buildings is that another different structures needs to replace the standing building and it needs to be demolished. Demolition techniques have evolved significantly over theyears, transforming what was once a brute-force endeavor into a sophisticated and strategic discipline. In this realm, the art of deconstruction blends seamlessly with cutting-edge technology, as experts employ a diverse range of methods to dismantle structures with finesse and efficiency. From controlled Implosions that bring down towering skyscrapers in a synchronized dance, to meticulous dismantling of historical landmarks preserving their heritage.

There are many types of demolition techniques:

Implosion, Wrecking ball method, Demolition breaker hammer, Pusher arm techniques, Thermic lance techniques, Concrete cutter, Excavator grapple, Demolition breaker machine, Hydraulic crusher, Hydraulic breaker, Manual demolition. We will explain a full detail about those demolition techniques.

3.2 Demolition techniques

- **Implosion:**

Implosion is a controlled demolition techniques where strategically placed explosive are used to bring down a building by collapsing it inward. This method is employed when there is limited space around the structure, and the goal is to minimize damage to surrounding properties.

Fig. 3.1: Deconstruction by implosion method

Fig. 3.2: Implosion method using dynamite

Fig. 3.3: Type of dynamite used in implosion method

Implosion demolition is a controlled demolition technique that strategically collapses a structure inward using explosives. The process involves strategically placing explosives at key structural points within the building to weaken its supports, causing the structure to collapse upon itself. This method is favored for its efficiency in demolishing tall structures and minimizing damage to surrounding buildings and infrastructure. Implosion requires meticulous planning, precise timing, and adherence to strict safety protocols to ensure a successful and safe demolition. It is often usedin urban environments where space constraints and the proximity of neighboring structures make traditional demolition methods impractical.

- **Wrecking ball method:**

The wrecking ball techniques involves a large, heavy ball suspended from a crane, which swingsand strikes the structure to cause damage. This method is less precise and is used for larger, less complex structures.

Fig. 3.4: wrecking ball method

Before commencing the demolition process, thorough planning and preparation are essential. This involves assessing the structure's condition, identifying potential hazards, and developing a demolition strategy that ensures safety and minimizes risks to surrounding structures and the environment. The wrecking ball used in the demolition process is chosen based on factors such as the size and type of structure being demolished, as well as the desired demolition rate. Wrecking balls come in various sizes and weights, ranging from a few hundred pounds to several tons, and are typically made of high-strength steel.

Manual demolition using breaker hammer:

Hand demolition is also known as manual demolition. Manual demolition involves the use of handtools and labor to dismantle structures. This method is suitable for small structures, delicate tasks,or when access to heavy machinery is limited.

Fig. 3.5: Manual method using breaker hammer

High reach arm techniques:

In this method of demolition, a machine like hydraulic excavator is lifted with the steel pusher Arm and pushed from the outside surface of the building. Demolition by pusher arm involves the progressive demolition of structure using machine equipment with a pusher arm attachment for applying horizontal thrust to progressively demolish the structure element, either by pushing into the structure or pulling out of the structure.

Fig. 3.6: Hydraulic excavator joints with steel pusher arm

Fig. 3.7: Pusher arm demolition techniques

Thermic lance techniques:

In this method of demolition, Concrete and reinforcement steel are broken by melting at hightemperature of 2000 to 4000 degree Celsius is produced.

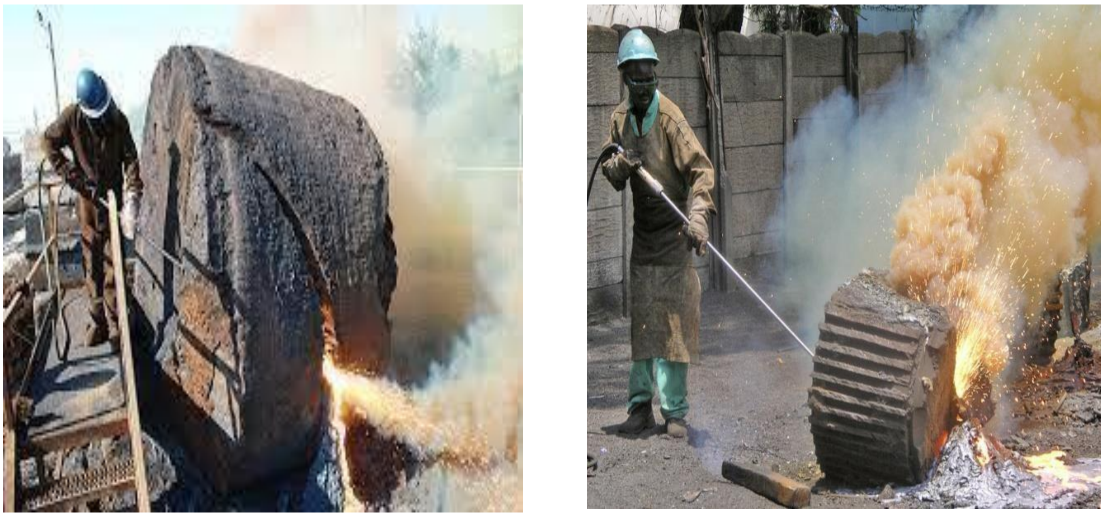


Fig. 3.8: Thermic lance techniques

- **Hydro pressure demolition:**

Pressure or hydro-demolition uses high-pressure water jets to break and remove concrete or other materials. This techniques is often employed for precise removal of specific section or surfaces.

Fig. 3.9: Pressure or hydro-demolition

3.3 Application

1. Implosion

- **Application:** Ideal for tall structure in confined spaces where the goal is to minimize collateral damage.
- **Benefits:** Controlled collapse, reduced impact on surroundings, efficient urban environments.
- **Limitation:** Requires careful planning, potential, for noise and dust, May not be suitable for structures with hazardous materials.

2. Wrecking ball

- **Application:** Suitable for larger, less complex structure.
- **Benefits:** Simple and cost-effective for certain application.
- **Limitation:** Lack of precision, generates vibrations and noise, limited to certain structures.

3. Manual demolition

- **Application:** suitable for small structures, delicate tasks or when access to heavy machinery is limited.
- **Benefits:** low cost, precise in certain situations.
- **Limitation:** Labor- intensive, time- consuming, may not be suitable for large-scale demolition.

4. High reach arm demolition

- **Application:** Effective for demolishing tall structures while maintaining a safe working distance.
- **Benefits:** Precision, suitable for high-rise buildings reduced risk to operators.
- **Limitation:** Limited to vertical structures, May require specialized equipment.

5. Thermic lance techniques

- **Application:** Rarely used due to safety concerns typically for weakening structure elements.
- **Benefits:** Controlled weakening of materials.
- **Limitation:** High safety risk, potential for uncontrolled fire, limited applicability.

6. Pressure demolition

- **Application:** precise removal of concrete of specific surfaces.
- **Benefits:** Minimal damage to surrounding structures, suitable for delicate task.
- **Limitation:** Limited to surface application, May not be effective for complete structural demolition.

7. Deconstruction

- **Application:** Preferred for environmentally sensitive projects or historic preservation efforts.
- **Benefits:** Maximizes material reuse and recycling, minimizes environmental impact, andpreserves architectural heritage.
- **Limitation:** Requires skilled labor and careful disassembly, may be slower and more expensivethan conventional demolition.

8. Selective demolition

- **Application:** Used in renovation projects or to salvage valuable materials from structures.
- **Benefits:** Allows for the preservation of certain elements, reduces waste, and supports sustainablepractices.
- **Limitation:** Time-consuming, labor-intensive, and may require specialized equipment fordismantling.

In conclusion, demolition techniques serve as essential tools in urban development and infrastructure management, offering a range of benefits and limitations. While explosive demolition provides rapid dismantling of large structures, it requires careful planning and safety measures. High-reach arm techniques offer precision and versatility, particularly in confined spaces, yet may have limitations in reach and complexity. Selective demolition and deconstruction prioritize sustainability by salvaging materials but demand significant time and labor. Implosion techniques excel in urban settings, minimizing disruption, but require meticulous planning. Mechanical demolition offers versatility and safety but can be time-consuming and costly for extensive projects. By understanding the specific requirements and considering the benefits and limitations of each method, demolition projects can be executed efficiently, safely, and sustainably, contributing to the evolution of urban landscapes while minimizing environmental impact.

3.4 Safety management in demolition

Demolition of buildings involves intricate process that necessitate stringent safety measures to protect workers, the public and the environment. Implementing a comprehensive safety management plan is crucial for minimizing risks and ensuring a safe successful demolition projects. Safety in demolition is very important because of this particular reasons.

Keywords: Worker well-being, public safety, Environmental consideration, Compliance with regulation, risk reduction, project continuity, employ morale productivity.

3.5 Risk assessment and hazard identification

Conduct a thorough risk assessment before initiating demolition activities. Identify potential hazards such as structural instability, Hazardous materials, utilities, and environmental risksassociated with dust and noise. Type of hazard in demolition projects:

1. Structural hazard:

Recognition of potential structural weaknesses, Such as compromised building materials or unstable foundation Identification of load-bearing elements that, if disturbed, could lead to unexpected collapse.

2. Chemical hazards:

Identification of hazardous materials present in the structure, such as asbestos, lead-based paint, or other toxic substances. Assessment of risk of exposure during demolition and proper procedurefor handling and disposal.

3. Environmental hazard:

Recognition of potential impacts on the surrounding environment, including dust, noise, and vibration. Assessment of risks to nearby ecosystem, water sources, and air quality.

4. Electrical hazard:
Recognition of electrical systems within the structure and risk of electrical shocks during demolition activity.

3.6 Type of risk assessment in demolition projects

1. Likelihood of occurrence:
Evaluation of how probable it is for hazard to manifest during demolition Consideration of factors like the demolition method, environmental conditions, and worker expertise.

2. Severity of consequences:
Assessment of the potential impact or harm if a hazard were to materialize. Evaluation ofpotential injuries, Damage, to property, or environmental harm.

3. Exposure and vulnerability:
Examination of who or what may be exposed to the hazard, including workers nearby residents, or the environment. Consideration of vulnerability factors, such as the presence of sensitive.

4. Control measures:
Development and implementation of control measures to estimate or mitigate identified hazard Establishment of safety protocols, Engineering controls, and personal protective equipment requirements.

3.7 Site specific safety plan during demolition

1. Introduction and project overview:
Brief project description, including the scope and purpose of the demolition Overview of the demolition site, including location, size, and any unique features.

2. Project team and responsibilities:
Identification of key personnel involves in the demolition projects and their roles. Responsibilitiesof each team member related to safety.

3. Hazard identification and risk assessment:
Comprehensive list of potential hazards specific to the demolition site. Detailed risk assessment for each identified hazard, including likelihood, consequences, exposure, and vulnerability. Control measures specific and mitigation strategies for each hazard.

4. Emergency procedures:
Clearly defined emergency procedure for various scenarios, including fires, structural failures, and hazardous material releases. Evacuation plans and assembly points. And emergency contract information and communication protocols.

5. Personal protective equipment:
List of required personal protective equipment for all workers on the demolition site. Procedure for proper selection, use, and maintenance of personal protective equipment.

In conclusion, implementing a site-specific safety plan in demolition projects is paramount for safeguarding workers, the public, and the environment. By thoroughly assessing site conditions, identifying potential hazards, and outlining clear safety protocols, such plans mitigate risks and promote a culture of safety on the worksite. Tailoring safety measures to the unique characteristics of each demolition site ensures that appropriate precautions are taken, leading to fewer accidents and injuries. Moreover, adherence to stringent safety standards not only protects human lives but also preserves surrounding structures, utilities, and ecosystems. Through proactive planning, continuous monitoring, and effective communication, demolition projects can be executed with utmost safety and efficiency. Ultimately, prioritizing site-specific safety plans demonstrates a commitment to responsible construction practices, fostering trust among stakeholders and contributing to the overall success of the project. The implementation of a site- specific safety plan in demolition projects is indispensable for mitigating risks and ensuring the smooth execution of operations. By addressing site-specific challenges and integrating tailored safety measures, such plans enhance productivity, minimize disruptions, and uphold regulatory compliance, ultimately leading to successful project outcomes.

Fig. 3.10: personal protective equipment

3.8 Structural analysis

Perform a detailed structural analysis of the building to be demolished. Identify load bearing elements, weak points, and potential collapse zone this analysis informs the demolition strategy and helps mitigate structural risk. Here are key aspects of structural analysis for demolition.

1. Structural assessment

- **Initial structural survey**: Visual inspection to assess the overall condition of the structure, Identification of anyvisible damage, deterioration or structural weaknesses.
- **Structural drawings and document:** Review of existing structural drawings and documentation to understand the original design and as building foundation.

2. Material analysis

- **Material identification:** Determination of the type of materials used in the construction (Concrete, steel, wood). The assessment of material properties, such as strength anddurability.

- **Presence of hazardous materials:** Identification of hazardous materials like asbestos, lead-based paint, or other contaminants,Development of a plan for safe removal and disposal of hazardous materials.

3. Load-Bearing element

- **Load path analysis:** Evaluation of the load path through the structure to understand how loads are transferred from one element to another, Identification of critical load-bearing elements
- **Structural stability:** Assessment of the structure's stability during and after partial demolition, assessment of potentialconsequences if key load-bearing elements are removed.

4. Dynamic analysis

- **Vibration analysis:** Evaluation of potential vibrations generated during demolition activities, Assessment of the impact on nearby structures and sensitive equipment.
- **Implosion consideration:** If implosion is considered a dynamic analysis to determine the controlled collapse of thestructures Identification of blast pattern and timing sequences.

5. Environmental impact

- **Dust and debris analysis:** Assessment of the potential environmental impacts, including dust and debris generation. Implement of control measures to mitigate environmental effects.

6. Documentation and reporting

- Detailed structural report: Compilation of a comprehensive structural analysis report. Recommendations for demolitionmethods, sequencing, and safety measures. Professional engineering assessment Involvement of structural engineers to ensure that theanalysis aligns industry standards and regulation.

3.9 Equipment safety and maintenance

Equipment and maintenance are critical aspects of ensuring the well-being of personal and the efficiency of demolition projects. Properly maintained equipment not only enhance safety but also contributes to the overall success of the demolition process. There are some key components given below:

1. Regular inspection:

- **Preoperational checks:** Conduct through pre- operational checks before each use to identify any visible defects, looseparts, or fluid leaks.
- **Scheduled inspection:** Implement a routine schedule for comprehensive inspections by trained technicians to identify potential issues.

2. Maintenance procedures:

- **Routine maintenance:** Establish a regularmaintenance schedule for equipment, including oil changes filterreplacements and lubrication.
- **Manufacturer guidelines:** Adhere to the manufacturers recommended maintenance procedures outlined in this equipmentmanuals.

3. Training on equipment operation:

- **Operator training:** Provide comprehensive training for equipment operators, covering safe operation, emergency procedures, and equipment-specific features.
- **Certification:** Ensures that operators are certified to operate specific demolition equipment.

4. Safety features:

- **Functionality check:** Regularly check and test safety features such as emergency stops, alarms, lights and interlocks toensure they are operational.
- **Installation of additional safety devices:** Consider installing additional safety devices, such as proximity sensors and back up cameras, toenhance equipment safety.

5. Documentation:

- **Maintenance record:** Maintain detailed records all maintenance and inspection activities, including dates, performedtasks and any identified issues.
- **Equipment manuals:** Keep equipment manuals readily accessible for operators and maintenance personnel to refer tomanufacturer guidelines.

6. Training on emergency repair:

- **Basic troubleshooting:** Train operators on basic troubleshooting and initial steps for addressing minor issue.

- **Emergency repair kit:** Equip operators with basic emergency repair kits for immediate response to minor equipmentissues.
- **Regular audits:** Conduct regular audits to confirm compliance with safety standards and regulation.

3.10 Environmental protection

Control access to the demolition site to prevent unauthorized entry. Utilize barriers, signage, andsecurity personnel to maintain a secure work environment. Implement measures to protect the environment during demolition. This includes dust control, water runoff management, and noise reduction strategies.

3.11 Cost factors

- **Mechanical demolition:**

Cost factors:

- Equipment rental: Excavator, Bulldozers, and other heavy machinery.
- Labor costs for skilled operators.
- Fuel and maintenance for machinery.
- Waste disposal.

- **Implosion demolition:**

Cost factors:

- Specialized implosion experts.
- Safety measures and monitoring.
- Controlled explosives and permits.
- Debris removal and Disposal.

- **High-reach excavator demolition:**

Cost factors:

- High-reach excavator rental.
- Skilled operators.
- Fuel and maintenance for machinery.
- Waste disposal.

- **Manual demolition:**

Cost factors:

- Skilled labor for manual demolition.
- Hand tools and small equipment.

- Waste disposal.

- **Hydraulic breaker demolition**:

Cost factors:

- Hydraulic breaker Equipment rental.
- Skilled operator.
- Fuel and Maintenance for machinery.
- Waste disposal.

- **Wrecking ball demolition:**

Cost factors:

- Wrecking ball Equipment rental.
- Skilled operator.
- Fuel and maintenance for machinery.
- Waste disposal.

3.12 Advantage and disadvantage

- **Mechanical demolition:**

Advantages:

- Controlled and precise.
- Suitable for a wide range of structure.
- Less noise and dust compared to some other method.

Disadvantage:

- Collateral damage.
- Limited precision.
- Longer procedure.
- Very costly.

- **Implosion:**

Advantage:

- Rapid demolition of large structures.
- Requires less heavy equipment.
- Can be cost effective for tall structures in urban areas.

Disadvantage:

- Implosion can generate significant dust and debris.
- Using dynamite in demolition creates ground vibration which can affectother structure nearby.
- Very costly.

- **High-reach excavator:**

Advantage:

- Suitable for tall or confined structures.
- Versatile and precise.
- Reduced noise compared to some methods.

Disadvantage:

- Limited precision.
- Generate high dust and debris.
- Potential collateral damage.

- **Manual demolition:**

Advantage:

- Cost-effective for small structures.
- Precision in tight spaces.
- Less dust and debris.

Disadvantage:

- Labor intensive.
- Slower pace compared to other methods.
- Safety risk.
- A lots of skill operator needed.

- **Hydraulic breaker demolition:**

Advantage:

- Effective for breaking down concrete and masonry.
- Versatile for smaller structures.
- Faster compare to manual method.
- Less noise pollution.

Disadvantage:

- Cost effectiveness over time may offset initial investment.
- Lots of skilled operators requires.
- It may be less effective on certain materials like heavy reinforced concrete.
- Proper waste management is crucial.
- So this is the complete discussion on cost factors, advantage and disadvantage of eachdemolition techniques.

3.12.1 Recycle and reuse from waste

Recycle and reuse of demolition can significantly contribute to sustainability and environmental conservation. Here are some key components to maximize the recycle and reuse of demolition waste:

1. **Waste categories:**
   - **Segregation:** It means the separation of demolition waste into categories such as concrete. Wood, metal, glass, plastics, and hazardous materials. It helps in efficient handling and recycling.

2. **Material inventory:**
   - **Quantification:** The quantities of each type of material need to be measure and recorded. This provides a baseline for tracking progress and determining the potential for recycling or reuse.

3. **Quality standards:**
   - **Recycle:** We need to establish a quality standards for materials. We also need to ensure that materials meetsafety and structural integrity requirements for reuse.

4. **Logistics planning:**
   - **Transportation planning**: create a plan for the efficient transportation of materials for recycle. Minimize transportation cost and environmental impacts.

5. **Documentation:**
   - **Record keeping:** Need to maintain detailed records of the types and quantities of materials generated, reused, or recycled. It can be valuable for reporting, certification, and future planning.

6. **Regulatory compliance:**
   - **Legal requirement:** Need to be aware of local regulations and permits related to the recycling and reuse of construction and demolition waste. Follow compliance with waste management laws and environmental standard.
   - In conclusion, recycling and reusing demolition waste offer multifaceted benefits that are vital for sustainable development. By diverting significant volumes of waste from landfills, these practices mitigate environmental degradation and reduce the demand for raw materials. Moreover, recycling and reusing materials from demolished structures contribute to energy conservation and decrease greenhouse gas emissions associated with traditional manufacturing processes. Economically, these practices foster job creation and stimulate innovation in the construction and recycling industries. Socially, they

enhance community engagement by promoting responsible waste management and fostering a culture of conservation. However, effective implementation requires collaborative efforts among stakeholders, including policymakers, businesses, and the public, to invest in infrastructure, education, and regulatory frameworks. By harnessing the potential of recycling and reuse in demolition waste, societies can move towards a more sustainable future while preserving valuable resources for generations to come.

3.12.2 Deconstruction instead of demolition

It is an environmentally conscious alternative to traditional demolition, focusing on salvaging and reusing materials from structures rather than demolishing them outright. For recycling and reusing demolition waste through deconstruction, consider the following steps:

1. **Pre-Deconstruction planning:**

- **Site Assessment:** We need to conduct a thorough assessment of the site to identify materials suitable for salvageand recycling.
- **Deconstruction plan:** We need to develop a detailed deconstruction plan that outlines the sequence of work, salvagepriorities and safety measures.

2. **Inventory:**

- **Detailed inventory:** Need to identify and catalog all materials in the structure. Select materials for reuse, recycling, ordisposal.
- **Prioritize salvage:** It has a high reuse potential, such as hardwood flooring, doors, windows, and architecturalelements

3. **Quality Assessment:**

- Material condition: We need to assess the condition of salvaged materials. Ensure they meet quality standards forreuse and recycling.
- **Testing:** Need to perform necessary tests on salvaged materials such as structural assessment forbeam and columns.

4. **Recycling partnerships:**

- **Collaborate with facilities:** Establish partnership with recycling facilities equipped to process specific materials not suitablefor direct use.
- **Market analysis:** Identify potential buyers or markets for recycled materials.

5. **Regulatory compliance:**

- **Permitting:** we need to ensure compliance with local regulations and obtain necessary permitsfor deconstruction activities.
- **Hazardous material handling:** Adhere to regulations for the safe handling and disposal of hazardous materials.

In conclusion, opting for deconstruction over demolition offers numerous environmental and social benefits by salvaging materials, reducing waste, and creating employment opportunities. It embodies a sustainable approach to construction and resource management

3.12.3 Material segregation and shorting

It is a critical processes in waste management system in construction and demolition projects. These processes help maximize the potential for recycling and reusing materials, reusing the overall environmental impact. Here is some guide on material segregation and sorting:

1. Pre-Project planning:

- **Waste assessment:** Create a thorough assessment of the type and quantities of materials expected to be generatedduring the projects.
- **Segregation plan:** A segregation plan needs to be develop for outlining how different materials will be separated on-site.

2. Identification and leveling:

- **Material identification:** Clearly level materials at the source to facilitate easy identification during segregation.
- **Color-coding:** We need to implement a color-coding system for bins or containers to visually distinguishdifferent types of materials.

3. Segregation at source:

- **On-site bins:** Need to provide separate bins or containers at the source of waste generation fordifferent materials (wood, metal, concrete).
- **Worker training:** Need to educate on-site personnel about the importance of segregatingmaterials and provide guidelines on what goes into each bin.

4. Construction and demolition waste categories:

- **Common categories:** Segregate materials into common categories such as concrete, wood, Metal,plastics, glass, requiring specialized handling.
- **Special materials:** Segregate special material such as electronics, Hazardous waste, requiringspecialized handling.

5. Sorting Facilities:

- **On-site sorting:** Need to establish on-site sorting areas to further segregate mixed into finercategories before transportation.
- **Of-site sorting:** Collaborate with of-site sorting facilities to handle more expensive segregationprocesses.

6. Recycling Partnerships:

- **Collaborate with recyclers:** We need to establish partnerships with recycling facilities capable of processing specific materials type.
- **Market analysis:** Need to identify potential markets for recycled materials and establishconnection with buyers.

7. Community engagement:

- **Communication:** For this attempt we need to communicate with the local community about the importance ofmaterial segregation and its positive environmental impacts.
- **Community programs**: We also need to consider involving the community in waste segregation program or initiatives.

8. Benefits of segregation and sorting:

- **Environmental benefits:** Reduces the amount of waste sent to landfills, conserves natural resources, saves energy, and reduces greenhouse gas emissions associated with waste disposal.
- **Economic benefits:** Increases the recovery of valuable materials, creates employmentopportunities in the recycling industry, and reduces the costs of waste management and disposal.
- **Social benefits:** Promotes public awareness of waste reduction and recycling, encourages sustainable consumption habits, and fosters a sense of environmental responsibility incommunities.

3.12.4 Concrete recycling

Crush concrete from demolished structures to produce recycled aggregate. It can be used as abase materials for new construction projects.

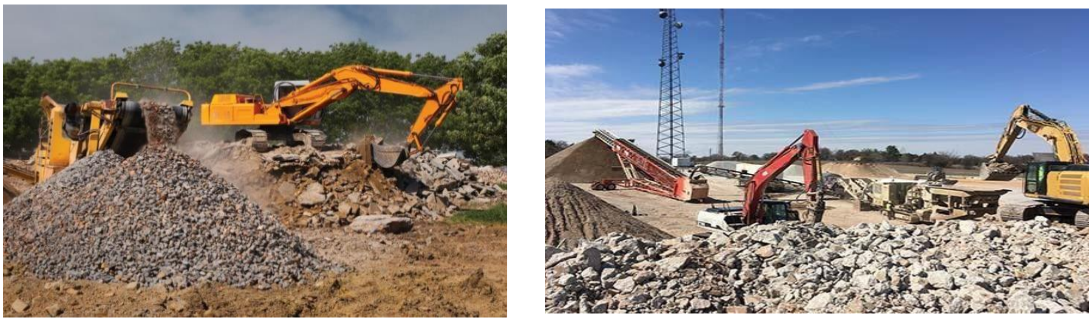


Fig. 3.11: concrete recycling

Concrete recycling repurposes demolished or unused concrete materials to create new concrete or construction products, minimizing waste and conserving resources. This sustainable practicereduces the environmental impact of construction projects, while also offering economic benefits and contributing to a more circular economy in the construction industry.

3.12.5 Metal recycling

Recycled metals from demolished structures, including beams, pipes and reinforcement. Metals can be melted down and recreate steel bars for new construction.

Fig. 3.12: Metal recycling process

3.12.6 Bricks and masonry recycling

Clean salvaged bricks and masonry materials in new construction projects. And crushed brickscan be used as aggregate in road construction.

Fig.3.13: Bricks and Masonry recycling

In conclusion, brick recycling presents an eco-friendly approach, minimizing waste and promoting resource conservation in construction, thereby fostering sustainability and efficiency within the building sector.

3.12.7 Asphalt recycling

Asphalt can be processed and reuse in new asphalt mixes for road construction.

Fig.3.14: Asphalt recycling

In conclusion, asphalt recycling stands as a sustainable solution that addresses environmental concerns while offering economic benefits. By reclaiming and reusing asphalt materials, this practice significantly reduces the demand for new aggregate and binder, conserving naturalresources and energy. Moreover, it minimizes the amount of waste sent to landfills, contributingto a cleaner and greener environment. Additionally, asphalt recycling often results in cost savings for both contractors and taxpayers, making it an attractive option for road construction and maintenance projects. As we continue to prioritize sustainability and efficiency in infrastructure development, the adoption of asphalt recycling will undoubtedly play a pivotal role in shaping a more resilient and environmentally conscious future.

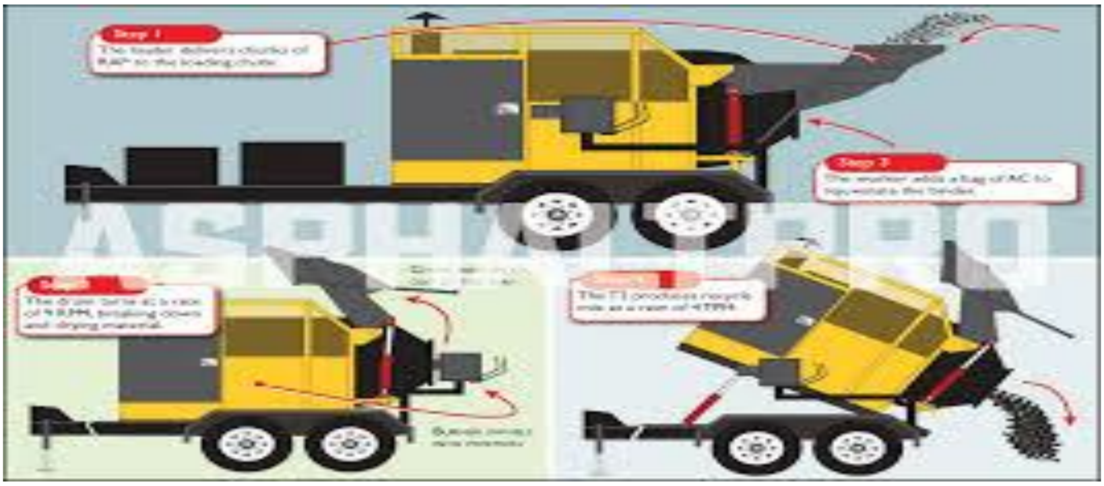


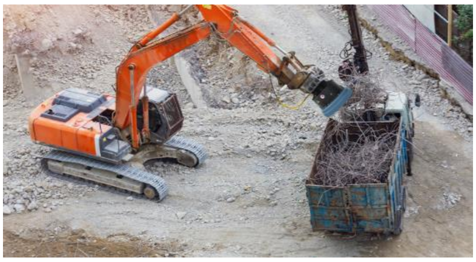
Fig.3.15: Asphalt Recycling Machine

3.12.8 Innovative technologies

We need to explore innovative technologies that can enhance the recycling process. For an example, advancement in robotics and auto machine may improve the recycle and reuse of demolition waste.

A. ASPHALT RECYCLER

B. EXCAVATOR GRAPLLE



C. EXCAVATOR MAGNET

D.THERMIC LENCE CUTTER MACHINE

Fig.3.15: Innovative technologies

In conclusion, innovative technologies in demolition revolutionize the industry, enhancing safety, efficiency, and sustainability while pushing boundaries towards a more advanced and responsible future.

3.12.9 Waste reduction

Deconstruction is basically a waste reduction strategy that involves systematically a building and structure with the goal of reusing as many materials as possible. For this approach minimizes the amount of waste sent to landfills and promotes sustainability. Here are some key ways to Deconstruction contribute to waste reduction. It is a sustainable practice aimed at minimizing the environmental impacts of building demolition Instead of demolishing a structure and sending all the materials to a landfill, Deconstruction involves carefully disassembling a building to recover and reuse valuable materials.

1. Identification of valuable materials:

Before the process begins, a careful assessment is made to identify materials that can be salvaged and reuse. Including structural components, fixtures, fittings, doors, windows, flooring and other valuable materials.

2. Safe disassembly:

A group of trained workers carefully dismantle the buildings. And ensure that salvageable materials are not damaged during the process. We will be needing some manuallabors, the use of specialized tools and sometime machinery.

3. Sorting and categorization:

After the materials are removed, they are sorted into differentcategories based on their type and condition which helps in efficient recycling and reuse efforts.

4. Material recovery:

Salvage materials are then processed for reuse for an example.

Reused on site: There are some materials, especially architectural like doors, windows, and fixtures may be used in the safe building or repurposed in other construction projects.

Recycled: Materials that cannot be directly reused may be sent to recycling facilities to new process into raw material.

5. Waste reduction:

After salvaging and reusing materials, the amount of waste sent to landfills is significantly reduced. This contributes to waste reduction and minimizes the environmental impacts associated with construction demolition activities.

6. Environmental benefits:

Salvage of materials through deconstruction helps conserve natural resources by extending the life span of existing materials. It also reduces the energy and emission associated with manufacturing new materials.

3.12.10 Maximizing material reuse

It involves optimizing the recovery and reuse of building materials during the process of deconstruction. Minimize waste, conserves, resources, and promote sustainability. We need to focus on selectively demolishing the building, targeting specific component for removal. It ensures that valuable and reusable materials are preserved and not damage during projects. Some of key aspects are given below:

1. Careful disassembly:

We need a lot of trained workers for carefully disassemble the building to exact materials intact. Itmay involve manual labor, the use of specialized equipment to avoid unnecessary damage to Salvageable materials.

2. Recondition and refurbishment:

We need to evaluate the condition of salvaged materials and, if needed in recondition.

It can extend the life of materials and enhance their suitability for reuse.

3. Materials donation programs:

We have to collaborate with non-profit organizations, community projects, or charities that might benefit from donated building materials. It will create an avenue for contributing to Social initiatives while maximizing the reuse of materials.

4. Educational outreach:

Raise awareness about the benefits of maximizing materials reuse through deconstruction. Need toeducate contractors, architects, and the community about the environmental and Economical, advantage of reusing materials in construction projects.

3.12.11 Reduced demolition waste

Traditional demolition methods generate a significant amount of waste, including concrete, metals and other materials. Deconstruction reduces the overall waste generated by carefully dismantling the structure and shorting materials for reuse or recycling, Here are some practical toachieve this goals.

1. Pre-Demolition assessment:

We need to conduct pre-demolition assessment to identify salvageable materials. Which involvesevaluating the conditions of materials such as wood, metal, glass and concrete to determine theirpotential for reuse.

2. Selective deconstruction:

For selective deconstruction instead of complete demolition, carefully disassemble the structure topreserve valuable materials rather than using methods that generate large amount of mixed waste.

3. Salvage and recovery plan:

We need to develop a salvage and recovery plan that outline which material will be salvaged, and how they will be extracted, and where they will be stored for recycle and reuse.

4. Training and education:

We need train workers on the importance of salvage materials during deconstruction. Provide education on proper techniques to minimize damage to reusable items during disassembly process.

5. Materials sorting and categorization:

We have to implement a systematic sorting process to categorize salvaged materials based on typeand condition. It will help use in efficient processing and facilities proper disposal of materials that cannot be reused.

6. Waste management plan:

We have to develop a comprehensive waste management plan that includes procedures forhandling, sorting and disposing of waste responsibly. Need to follow local regulation and guidelines for waste disposal.

7. Community engagement:

We have to engage with the local community to create awareness about the benefits of reducing demolition waste through deconstruction. We also need to encourage them to participate insalvage and reuse initiatives.

3.12.12 Environmental impact reduction

It involves implementing strategies to minimize the environmental consequences associate with building demolition. In this approach focuses on salvaging and reusing materials, thereby reducing the volume of waste send to landfills and mitigating the depletion of natural resources. There are some key components given below:

1. Selective deconstruction:

Opting for selective deconstruction over complete demolition helps preserve valuable materials, minimizing the environmental impact associated with generating large amount of mixed waste.

2. Material salvage and reuse:

We need to Prioritized the salvage and reuse materials, such as structural components, fixture, andarchitectural elements, contributes to resource conservation by extending the lifespan of existing material and reducing the need for new production.

3. Materials sorting and recycling:

Need to implement a systematic sorting processes helps identify materials suitable for materials sorting. Recycling salvaged materials such as metal, concrete, woods, reduces the environmental impacts of extracting and processing raw materials for new construction.

4. Regulatory compliance:

Advocating for and complying with regulations that promote sustainable demolition practices reinforce the commitment to reducing environmental impact. This is also includes adhering to waste disposal regulation.

5. Continuous improvement:

Evaluating the effectiveness of deconstruction processes allows to continuous improvement in waste reduction strategies. Incorporating feedback and lessons learned enhances overall sustainability.

3.12.13 Lower disposal cost

Lower disposal costs in waste reduction through deconstruction involves implementing practice that minimize the amount of waste sent to landfills. Here are some strategies to achieve cost saving in waste reduction through deconstruction:

1. Material salvage and reuse:

Prioritize the salvage and reuse of materials, as this reduces the volume of waste that needs to be disposed of. This kind of materials can be used on-site or off-site contributing to cost savings by avoiding the need for new purchases.

2. On-site reuse:

We need to explore opportunities for on-site reuse of salvaged materials in new construction projects. This reduces the need for transporting materials, saving on, disposal costs associatedwith off-site waste management.

3. Off-site reuse and donation:

We need to establish partnerships with salvage yards, building materials Off-site can be a cost- effective alternative to traditional disposal methods.

4. Community engagement:

We need to engage with the local community to create awareness about the benefits of reducing demolition waste through deconstruction. We have to encourage community members to participate in salvage and reuse initiatives.

5. Continuous improvement:

Regularly assess and evaluate the effectiveness of the deconstruction process. Use feedback to make continuous improvements in waste reduction strategies and overall sustainability.

3.12.14 Technological advancement

In the field of demolition there are various technological advancements. Here are some technological trends and advancement up to the point.1. Implosion technology, 2. High-Reach excavator, 3. Robotic demolition Equipment4. Drones for surveying, 5. Vibration and noise control technologies etc.

Remote control demolition equipment and autonomous machinery can enhance safety by allowingoperators to control equipment from a distance, reducing exposure to hazardous environment.

Fig. 3.16: Remote-controlled and autonomous machinery

3.12.15 Robotics

It will play a more significant role in demotion tasks, with robot design to navigate complex structures and perform targeted demolition tasks. For advanced imaging and sensing and assessing structures before demolition, providing valuable data for planning and execution.

Fig. 3.17: Remote controlled machinery

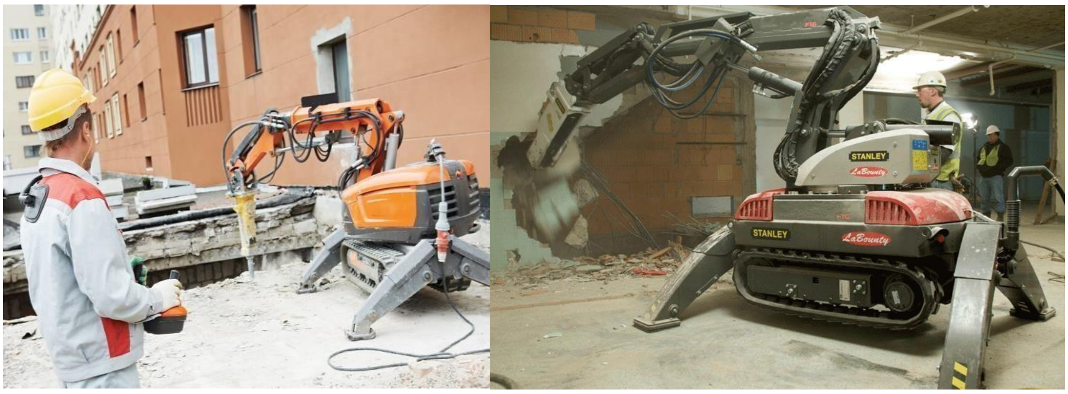


Fig. 3.18: Robotics in demolition work

3.12.16 Green demolition practice

It is also known as deconstruction or sustainable demolition, is an environmentally friendly approach to the process of dismantling or demolishing structures. The goal of green demolition is to maximize the recovery and reuse of materials, minimize environmental impact, and reduce the amount of waste sent to landfills. Here are some key aspects of green demolition:

1. Material salvage and reuse:
Green demolition emphasizes salvaging and reusing materials from the building being demolished like doors, windows, lumber, fixtures, and many more.

2. Selective demolition:
Green demolition often involves selective dismantling. This approach allows the careful removal orspecific components while preserving others for reuse.

3. Recycling of construction materials:
Materials which cannot be reused are often being recycled. It also includes concrete, metals, and other materials.

4. Waste management and minimization:
Green demolition minimize the amount of waste sent to landfills. Waste separation and management systems are implemented to ensure that recyclable material are properly processed.
5. Community and social impact:
Green demolition projects seek certification from organizations that specialize in sustainable construction practices. Certification based on criteria such as material recycling rates, energy efficiency and environmental impact reduction.
In conclusion, embracing green demolition practices fosters environmental sustainability by reducing waste, conserving resources, and minimizing ecological impact. It represents a crucial step towards creating a more environmentally conscious construction industry

Fig. 3.19: Green demolition key words

3.12.17 Smart demolition equipment
The concept of smart demolition equipment was emerging, integrating advanced technologies intotraditional demolition machinery to enhance efficiency, safety, and environmental sustainability. Here are some features and technologies associated with smart demolition equipment.

1. Telematics and gps tracking:
Incorporating telematics and GPS tracking systems into demolition equipment allows

for real- time monitoring of machinery location, usage, and performance. This helps in optimizing operations, tracking maintenance needs, and ensuring equipment security.

2. IOT sensors:

IOT sensors can be installed on demolition equipment to monitor various parameters, such as fuelconsumption, engine performance and equipment health.

3. Remote monitoring and control:

There are many types of smart demolition equipment that can be remotely monitored and controlled, allowing operators to manage machinery from a safe distance. This features enhances safety during hazardous or complex demolition task.

4. Advanced robotics:

Robotics demolition equipment, equipped with advanced sensors which can perform precise and controlled demolition tasks. This robots can navigate through complex structures and selectively dismantled components.

5. Drones for site inspection:

Drones are equipped with cameras and sensors are used for site inspection and surveying. They provide detailed aerial views of the demolition sites, helping in planning and assessing the structure.

3.12.18 Summary

- Demolition techniques encompass a variety of methods employed to dismantle structures, ranging from manual demolition using hand tools to mechanized techniques like controlled implosion or deconstruction. Factors influencing demolition costs include the size and complexity of the structure, accessibility, environmental regulations, disposal fees, and labor requirements. Technological innovations have revolutionized demolition practices, introducing safer, more efficient methods such as robotic demolition, laser cutting, and advanced monitoring systems to minimize risks and increase precision. Waste reduction strategies focus on salvaging materials for reuse, recycling, or repurposing to mitigate environmental impact and reduce disposal costs. Implementing careful planning, innovative technologies, and sustainable practices can optimize demolition processes, enhance safety, and mitigate environmental concerns while controlling costs. Top of Form.

CHAPTER 4 RESULTS AND DISCUSSION

4.1 Demolition trends and practices

The overview of demolition practices reveals a diverse range of techniques employed acrossdifferent regions and sectors. While mechanical demolition remains the most common method, there is a growing interest in sustainable approaches such as deconstruction and selectivedismantling. These trends reflects a broader shift towards environmentally responsibleconstruction and urban development.

4.2 Economic consideration

Demolition projects often intersect with social and economic dynamics, impacting communities, labor markets and property values. While demolition can simulate economic growth through job creation and redevelopment opportunities, it also poses risks such as displacement and gentrification. Moreover, the cost of demolition, including noise pollution and safety hazards, underscore the importance of community engagement and equitable urban planning.

4.3 Technological innovation

The review of technological innovation and best practices demonstrates a growing emphasis on efficiency, safety, and sustainability in demolition operation. Advancements such as robotic demolition systems, remote monitoring technologies, implosion techniques, and reducing environmental footprints by deconstruction, furthermore knowledge sharing and capacity buildinginitiatives play a crucial role in disseminating best practices and fostering industry- wide innovation.

4.4 Recycle and reuse from demolition projects

Recycling and reusing materials from demolition projects can have several positive resultsincluding:

1. Environmental benefits, 2. Cost savings, 3. Resource conservation, 4. Community Benefits.

CHAPTER 5 CONCLUSION & RECOMMENDATION

5.1 Recommendation

Sustainable construction and demolition practices are crucial for minimizing environmental impact and promoting responsible resource management. Several emerging trends in sustainable construction and demolition practices were gaining traction. Here are some key components given below.

1. Circular economy approach:

- **Materials reuse and recycle:**

Increasing emphasis on salvaging and reusing materials from demolished structures, promoting the circular economy by reducing waste and conserving resources.

2. Advanced demolition techniques:

- **Selective demolition:** Employing advanced demolition techniques that allow for the selective removal of specific materials or components, minimizing waste generation.
- **Deconstruction:** Taking apart structures with the aim of preserving and reusing as many components as possible, rather than resorting to traditional demolition.

3. Green demolition certification:

The development and adoption of green demolition certifications that encourage and recognize sustainable practices in the construction and demolition industry.

4. Waste management innovation:

Exploring innovative methods to convert construction and demolition waste into energy, reducing the environmental impact associated with disposal in landfills. Implementing advanced sorting technologies to streamline the separation of different materials, facilitating efficient recycling and reducing contamination.

5. Government regulation and incentives:

Governments are increasingly implementing regulations to enforce sustainable demolition practices, setting standards for waste management and encouraging responsible deconstruction. Providing financial incentives or tax breaks for construction and demolition companies that adopt sustainable practices.

5.2 Conclusion

This thesis concludes with a synthesis of key finding, emphasizing the interconnected nature of various aspects in construction demolition. It underscores the importance of adopting an integrated approach that considers. Environmental impact, cost efficiency, safety, and recycling

Strategies to achieve sustainable demolition practice.We have also discovered about the:

1. Safety protocols and risk management.
2. Economic consideration and cost factors.
3. Technological innovations in demolition practice.
4. Recycle and reuse from demolition waste.

Which are very necessary for a sustainable demolition practice.

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THE END