The Green Connection
– Construction With A Conscience

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“Going Green” In Real-estate Project Development Produces High Performance Building That Reduces Its Environmental Footprint Through Sustainable Site Selection, Conservation Of Energy Resources, While Improving Social & Economic Requirements

Delivering A “Green Building” Requires More Positive & Proactive Actions By All Parties Involved In The Entire Building Process With The Emphasis Of Balancing Amongst Environmental Sustainability, Social & Economic Development

Sustainability & The Construction Industry

Establishing The Principles & A Model For Sustainable Construction

1. Conserving (To Minimise Resource Consumption);
2. Reusing (To Maximise The Reuse Of Resources);
3. Renewing/ Recycling (To Use Renewable Or Recyclable Resources);
4. Protecting The Nature (To Protect The Natural Environment);
5. Using Non-toxic Materials To Create A Healthy, Non-toxic Environment;
6. Economic Benefits (To Apply Life Cycle Cost Analysis); &
7. Providing Quality Products

The Approach Is To Rethink Construction Operation In Four (4) Key Areas

1. Energy

2. Materials
   Choosing, Using, Re-using & Recycling Materials During Design, Manufacture, Construction & Maintenance To Reduce Resource Requirements

3. Waste
   Producing Less Waste & Recycling More

4. Pollution
   Producing Less Toxicity, Water, Noise & Spatial Pollution
Sustainable Construction

Construction is the process during project implementation that transfers the project design plans into reality that encourages & supports a better quality of life.

- It involves utilizing various types of resources including human resources, equipment, materials, & financial resources when construction activities are undertaken according to design specifications & requirements.

- Construction work, repair, maintenance & demolition consume resources & energy but often generate waste & pollute the environment.

Waste — A Major Issue

A waste, as the name implies has no value added. Managing waste on construction site is an effective way of achieving sustainable construction.
Construction Waste

- Any Thing Or Process That Does Not Add Value To A Product
- Any Unusable Or Unwanted Substance Or Material
- Any Materials Unused & Rejected As Worthless Or Unwanted
- Any Substance Or Object The Holder Discards, Intends To Discard Or Is Required To Discard

Construction Waste

- Waste Is Directly Linked To Human Development Both Technologically & Socially
- The Composition Of Different Wastes Have Varied Over Time & Location With Industrial Development & Innovation Being Directly Linked To Waste Materials
- Waste Is Sometimes A Subjective Concept As Items That Some People Discard May Have Value To Others
Construction Waste

Construction Waste is expensive & often bad for the environment.

Construction Waste are unwanted material produced directly or incidentally by the construction or industries:
- Building materials such as bricks, nails, electrical wiring, reinforcement, etc.
- Waste originating from site preparation – dredging or excavated materials, tree stumps, rubble, etc.
- Construction waste may contain lead, asbestos or other hazardous substances.

Observational research has shown that construction waste can constitute as high as 10 to 15% of the material cost of a project.

A much higher percentage than the 2.5-5% usually assumed by the estimators & quantity surveyors.

Since considerable variability exists between & among construction sites there is much opportunity for reducing this waste.
Waste Management

Waste Management is the collection, transport, processing, recycling or disposal & monitoring of waste materials. The term usually relates to materials produced by human activity & is generally undertaken to reduce their effect on health, the environment or aesthetics. Waste management is also carried out to recover resources from it.

Waste Hierarchy & Waste Management Strategies

The waste hierarchy refers to the 3Rs of reduce, reuse & recycle that classify waste management strategies according to their desirability. The 3Rs are meant to be a hierarchy in order of importance.

Reduce Reuse Recycle
**Waste Hierarchy & Waste Management Strategies**

- **Prevention**
- **Minimisation**
- **Reuse**
- **Recycling**
- **Recovery (Energy)**
- **Disposal**

3Rs Are Categories At The Top Of The Disposal Options
They Include A Variety Of Initiatives For Disposing Of Discards
Options Lowest On The List Are Least Desirable

- **Reduce**
  - To Buy Less & Use Less
- **Reuse**
  - Elements Of The Discarded Item Are Used Again
- **Recycle**
  - Discards Are Separated Into Materials That May Be Incorporated Into New Products


It Is Clear That The Way The Industry Manages Waste & Resources Has To Be Improved. The Question Now Is – How?
Site Waste Management Plan
For Sustainable Construction

Site Waste Management Plan (SWMP)

- Provides Details Of How Construction Waste Will Be Handled & Disposed Of At All Stages During A Construction Project
- Helps To Encourage Efficient Use Of Materials & Resources, Improve Management Of Waste, Cut Costs & Reduce Unplanned Carting & Tipping
- Save Cost Through Effective Waste Management
Site Waste Management Plan (SWMP)

Identifies Waste & Considers How To Manage It
- Improves Material Procurement, Delivery, Store & Inventory Management Processes – Supply & Value Chain Management
- Establishes Site Waste Management Communication & Training
- Stores & Handles Waste Materials Effectively
- Monitors Site Waste Management Plan's Effectiveness
- Reviews & Learns From Site Waste Management Plan For Continuous Improvement

Benefits Of Good Waste Management Practices
- Lower Disposal Cost
- Avoidance Of Waste Transportation Cost
- Greater Reuse/ Recycling Of Material On Site & Saving On Raw Material Purchased
- Lower Level Of Material Wastage
Lean Construction As Part Of Site Waste Management Plan (SWMP)

The Lean Principles

1. Identify Value
2. Map The Value Stream
3. Create Flow
4. Establish Pull
5. Seek Perfection
The Lean Principles

Lean is about designing & operating the right process & having the right systems, resources & measures to deliver things right first time.

Essential to this is the elimination of waste – activities & processes that absorb resources but create no value.

Waste can include mistakes, working out of sequence, redundant activity & movement, delayed or premature inputs, & products or services that don’t meet customer needs.

Philosophy of Lean Construction

People Involvement

Continuous Improvement

Owners

Standardisation

Short Lead Time

Built-in Quality/Waste Elimination
Kaizen Or Continuous Improvement (PDCA)

**Plan**
- Investigate Cause Of Troublesome Condition & Create Proposal For Modification Or Resolution

**Do**
- Perform Test Implementation Of The Plan

**Check**
- Assess Results Of Test For Effectiveness

**Adjust/Act**
- Modify The Original Condition Or Define New Standard Procedure If Result Is Satisfactory Or Otherwise Refine Plan & Repeat The Cycle Until Satisfactory Results Are Achieved & The New Improvement Become The Standard When The Process May Begin Again To Attain Next Improvement

Value Stream Mapping

Steps In Value Stream Mapping
1. Identify Deliverable Target
2. Draw Current State Value Stream Map That Shows Current Steps, Delays Information Flows Required To Deliver Target Service
3. Assess Current State Value Stream Map In Terms Of Creating Flow By Eliminating Waste
4. Draw Future Value Stream Map
5. Implement Future State
6. Assess & Adjust New Process As Needed

Building Information Modelling (BIM) & Real Time Analysis

Building Information Modelling (BIM) Is A Collection Of Software Programmes That Help Coordinate Design Effort Of Multiple Disciples & Allow For More Automated & Simplistic Estimate & Analysis Of Schedule, Cost & Performance

BIM Is Highly Complementary To Lean Techniques
Building Information Modelling (BIM) & Real Time Analysis

The Range Of BIM Applications Covers Virtually Every Phase Of The Specific Construction Product Development Process
- Planning,
- Design & Documentation,
- Cost Planning & Estimating,
- Scheduling,
- Fabrication & Coordination,
- Construction & Coordination,
- Maintenance
- Facility Management

Target Value Design (TVD)

A Design Strategy & Process That Offers Designers Opportunity To Engage In Design Conversation Concurrently With Those Who Will Procure Services & Execute Design
- It Focuses On Designing Based On Articulated Project Values That Become Design Criteria Rather Than Mere Aspirations;
- Rather Than Estimate Based On Detailed Design, Design Is Based On A Detail Estimate
Last Planner System/Commitment Based Planning

Projects Are Often Chaotic & Schedules Are Rarely Accurate & Many Projects Are Treated As “A Commitment-free Zone”

- Last Planner Is Founded On The Reality That Advance Planning Never Accurately Predicts The Future That Conditions On Projects Change & Plans Will Need To Be Changed
- Last Planner System Performs Planning In Increasing Levels Of Detail As The Time For Performance Gets Closer
- It Also Assumes That Teams Can Learn From Planning Failure & Develop Strategies To Improve Ability To Plan Reliably

Critical Success Factors Of Lean Construction

- Waste Elimination
- Designing It Right
- Understand The Cost & Whole Life Costing & Not Be Driven By Price
- Utilise Knowledge & Expertise
- Integrate The Team By Working With The End To End Supply Chain In An Integrated Manner
- Understand The End To End Process
- Measure Performance To Include 360 Degrees Reporting On Performance
- Training
- Off Site Prefabrication & Multi-skilling
- Benchmarking Performance
- Supplier Development
A Well Organised Site Minimises Or Eliminates Wastes & Site Accidents

Reducing Waste & Accidents Through Good Practice Of Housekeeping

Housekeeping Involves Keeping The Construction Site Safe For Workers & Others &
- Keeping Work Areas Neat & Tidy,
- Removing Waste,
- The Layout Of The Site,
- Storage & Maintenance
- Accident & Fire Prevention

Our Business is Cleaning Up
Designated Storage Space Allows Materials To Be Properly Stored On Site

Measures That Mitigate Generation Of Dust Are Recognised & Done Through Various Simple Measures

Covering Stock Piles With Sheets Helps To Mitigate Dust Generation On Site

Reducing Waste & Accident Through Good Practice Of Housekeeping

Through Good Practice Of Housekeeping
Measures That Mitigate Generation Of Dust Are Recognised & Done Through Various Simple Measures:
- Spraying Water On Site Access Roads & During Hacking Work Will Reduce Dust Generation Especially During Dry Weather
- Reducing Waste & Accident Through Good Practice Of Housekeeping

Measures That Mitigate Generation Of Dust Are Recognised & Done Through Various Simple Measures:
- Spray Water To Dampen Dust Generating Materials & Cover Them Properly During Transportation
Providing Regular Maintenance of Machinery & Equipment Greatly Reduces Emissions From Machinery & Equipment Thus Controls Pollution

Reducing Waste & Accident Through Good Practice of Housekeeping

The Human Factor Plays A Crucial Role In Ensuring Proper Housekeeping & Cleanliness On Site
- Designate Site Personnel Or Controller To Oversee, Implement & Inspect Housekeeping On Site
Does Any Of This Look Familiar?
What Issues Would Result?

The 5S Concept Of Housekeeping

- A Structured Method For Achieving, Maintaining & Improving The Standard Setup, Organisation, Layout & Control Of A Work Area So As To Ensure Safe & Efficient Operations With Minimum Waste
- The Concept Of 5S Is Generally Regarded To Have Originated From Toyota Of The Japanese Automotive Industry Reputed For Their Cleanliness & Orderliness Through The Ability Of Instilling A Sense Of Responsibility & Discipline Amongst The Workforce
- It Is Considered One Of The Fundamental Building Blocks For An Organisation Striving To Establish Lean Practices & A Culture Of Continuous Improvement
The Purpose Of 5S
- To Improve The Organisation & Working Standards Of The Work Environment
- To Create A Work Environment That Supports
  - Remove Waste From Workplace
  - Reduce Non-Value Added Activities
  - Provide Environment For Continuous Improvement
- To Provide The Basis For Other ‘Building Blocks’

It Is NOT About Engineering & Science!
Everyone Can Take Part & Make It Happen

Introducing The 5S Concept Of Housekeeping
The Detail 5S Principles
- The 5S Principles Are Means Of Improving Work Environment
- The 5Ss Are 5 Japanese Words Representing Steps To Workplace Organisation & Housekeeping
- Each “S” Designates A Progression In Concept Implementation

The 5S Principles
- Seiri: Clearout and Classify
- Seiton: Configure
- Seiso: Clean and Check
- Seikei: Conformity
- Shitsuke: Custom & Practice