Dar Al Riyadh Insight #101
Minimizing Construction Waste
Construction Phase

Dar Al Riyadh Insights reflect the knowledge and experience of our Board, executives and staff in leading and providing PMC, design and construction management services. Dar Al Riyadh believes in the importance of broadly sharing knowledge with our clients and staff to improve project outcomes for the benefit of the Kingdom of Saudi Arabia.

Minimizing Construction Waste

Construction phase. During the construction phase, earlier design and procurement activities in which construction has actively participated are built upon. Construction's involvement extends back to the inclusion of a construction basis of design before design commences. The construction waste management plan also should be developed at an early stage.

Waste minimization during the construction phase has as much to do with efficient productive construction execution as it does with some of the control measures outlined below. Low productivity results in extended project schedules and with it extension of construction waste streams associated with extended general conditions periods.

Poor quality construction in the first instance, out of sequence construction, and poor scope control all result in higher rework levels and with it growth in construction waste streams.

Specific construction waste minimization efforts to consider include:

- Selection of appropriate energy sources
    - Select sites may support use of solar power for site-based sensors, lighting, or integration with grid supplied power. This has proved beneficial in remote sites and reduces the need for hydrocarbon-based fuels.
    - Purchased power may include a requirement for green power to be supplied.
    - Hydrogen/ammonia for onsite power generation (emerging technology).
    - Onsite fleet utilizing electric vehicles and natural gas buses (larger sites).
- Optimization of onsite use of power
    - Cognizance of optimal diesel generator operating load factors.
    - Utilization of microgrids to minimize diesel generator idling and stand-by loads through optimized dispatch of onsite diesels (larger sites).
- Cut and fill balancing to eliminate need for offsite disposal of surplus soil.

- Maximization of the use of environmentally friendly materials such as those identified in the design stage (self-healing concrete, more carbon-friendly laminated timber, natural bamboo when scaffolding is required, unfired wool bricks, and bio-char by-product) for contractor designed facilities and specified materials.
- Use of carbon absorbing concrete.
- Reuse of construction waste materials
    - Chippings of scrap wood on site can provide mulch or groundcover.
    - Gypsum (de-papered) can be used in limited quantities as a soil amendment.
    - Leftover paints can be remixed and used as primer coat.
    - Concrete, masonry, and brick waste (perhaps from onsite demolition) can be recycled onsite as fill or subbase material.
        - Crushed concrete aggregate can replace new aggregate in new concrete. This substitution is a popular option because of the global sand shortage.
    - Glass (from demolition of existing site facilities) may be crushed and used as aggregate in concrete.
    - Stone/clay may be pulverized into gravel and used in specialized products like thermal insulating concrete or become filler beneath roadbeds or driveways.
- Segregated packaging materials can be returned to suppliers for reuse.
- Recycling of segregated waste streams
    - Cellulose materials, including wood, can be recycled for new engineered wood products and mulch
    - Cardboard packaging
    - Asphalt
    - Metals
    - Glass
    - Plastics (non-contaminated; segregated)
- Capture of site runoff and treatment to minimize liquid waste discharges and potential environmental problems; reuse of site runoff for dust control.
- Leverage means and methods and focused general conditions to support waste minimization.
    - Eliminate double-handling of materials (wasted energy; increased risk of damage)
    - Install onsite material shredders and compactors (promotes onsite recycling and reduced waste volumes)
    - Provide bins for waste collection for each subcontractor (facilitates enforcement of subcontractor waste minimization commitments; support segregation of waste for recycling)
    - Establishing temporary bins in each building work zone and collecting waste by trade
    - Prevent waste mixing with soil except where planned (as soil amendment)
    - Maintain a clean site to limit inadvertent inclusion of materials into the waste stream (also supports site safety)

- Conduct cutting operations in central areas supporting segregated waste collection and reuse of lumber, rebar, and piping
- Establish recycling targets at each construction phase (monitor and track)
- Frequently collect waste at the site to support waste segregation and recycling

Construction waste minimization also requires that the causes of added waste generation through poor management oversight and practices be addressed. These often result in extended schedules and include:

- Poor management oversight and supervision
  - Absence of a construction waste reduction plan
  - Poor project management
  - Inadequate communication and coordination
- Inadequate subcontractor selection process and oversight
- Inadequate project control practices (construction planning; inaccurate estimates and schedules; poor schedule control, resulting in delays)
  - Inaccurate quantity takeoffs
- Poor scope control or design quality
  - Incomplete design at time of procurement or contracting notice to proceed (NTP)
  - Delayed design preparation or approvals
  - Poor quality design (high requests for information/RFIs; errors and omissions)
  - Frequent changes in scope or design
- Poor quality construction
  - Inadequate materials testing
  - Poor or inconsistent means and methods
  - Poor workmanship
  - Rework due to above or out of sequence construction
- Inadequate materials and equipment
  - Shortage of materials
  - Late delivery of materials and equipment
  - Equipment availability and poor maintenance resulting in failures
  - Poor inventory control
- Extended schedules associated with lower than planned labor productivity
  - Labor shortages (unskilled)
  - Lack of appropriate experience (skilled)
  - Low labor productivity
  - Delays in decision making
  - Slow information flows
  - High absenteeism

Summary

Construction waste reduction represents a significant opportunity to support efficient design, procurement, and construction while reducing project costs and supporting project environmental, social, and governance (ESG) goals. It begins at project conception— with owner commitment and clearly defined outcomes. The defined owner's requirements are then included in an expanded basis of design that is developed before design begins.

Construction waste can be viewed as consisting of solid, liquid, and gaseous wastes. Effective scope control is an essential first step in their minimization. Efforts begun in the design stage then continue throughout the procurement and construction phases, guided by the construction waste management plan developed at an early stage.

Waste minimization during the construction phase has as much to do with efficient productive construction execution as it does with the various control measures outlined in this Executive Insight. Poor quality construction in the first instance, out of sequence construction, and poor scope control all result in higher rework levels and with it growth in construction waste streams.

Finally, construction waste minimization requires that the causes of added waste generation through poor management oversight and practices be addressed.