

# **Waste in Turkish Construction: Need for Lean Construction Techniques**

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# Waste in Construction:

Waste in construction is defined as “the difference between the value of those materials delivered and accepted on site and those used properly as specified and accurately measured in the work, after the deducting cost saving of substituted materials and those transferred elsewhere”.

# Main Material Waste Causes in Turkey:

Source	Causes of Material Waste	Frequency (%)
Design	Lack of information about types and sizes of materials on design documents	13
	Design changes and revisions	12
	Error in information about types and sizes of materials on design documents	10
	Determination of types and dimensions of materials without considering waste	3
Procurement	<b>Ordering of materials that do not fulfill project requirements defined on design documents</b>	<b>86</b>
	Over-ordering or under-ordering due to mistakes in quantity surveys	8
	Over-ordering or under-ordering due to lack of coordination between warehouse and construction crews	4
Material Handling	Damage of materials due to deficient stockpiling and handling of materials	16
Operation	<b>Imperfect planning of construction</b>	<b>61</b>
	<b>Workers' mistakes</b>	<b>32</b>
	Damage caused by subsequent trades	3
Residual	Conversion waste from cutting uneconomical shapes	22
Other	Lack of on site materials control	23
	Lack of waste management plans	10



**Example of imperfect planning of construction**



**Example of wrong stockpiling of materials**



**Example of over-ordering resulted from mistakes in quantity surveys**



**Example of conversion waste from cutting uneconomical shapes**

# Main Time Waste Causes in Turkey:

Source	Causes of Time Waste	Frequency (%)
Design	Interaction between various specialists	19
	Rework due to design changes and revisions	13
	Lack of information about types and sizes of materials on design documents	10
	Error in information about types and sizes of materials on design documents	6
	Contradictions in design documents	3
	Delay in approval of drawings	3
Procurement	<b>Delay in material supply</b>	<b>72</b>
	<b>Receiving materials that do not fulfill project requirements defined on design documents, and waiting for replacement</b>	<b>53</b>
	Delay in transportation and/or installation of equipment	6
Operation	Scarcity of crews	29
	Unrealistic master schedule	23
	Rework due to workers' mistakes	16
	Scarcity of equipment	13
	Waiting for design documents and drawings	9
	Lack of coordination among crews	8
	Choice of wrong construction method	5
	Accidents due to lack of safety	4
Other	<b>Irregular cash flow</b>	<b>39</b>
	Severe weather conditions	35
	Bureaucracy and red tape	6
	Unpredictable local conditions	6
	Acts of God	5



**Example of lack of safety**



**Example of lack of safety**

# Actions Taken in the case of Loss:

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<b>Actions Taken in the case of Loss</b>	<b>Frequency (%)</b>
Procuring required material immediately	73
Increasing the number of crews	44
Increasing working hours	22
Revision of master schedule	16
<b>Nothing</b>	11
Increasing the amount of equipment	10
Procuring required equipment immediately	7
Warning crews	6
Changing actual construction method	2

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# A FRAMEWORK FOR REDUCING WASTE IN THE TURKISH CONSTRUCTION INDUSTRY

<b>Source</b>	<b>Lean Construction Techniques</b>
Design	Project definition, design structure matrix, 3D modeling/shared geometry, cross functional teams, concurrent design, set based design, sharing incomplete information, reduced batch sizes, collaborative design, design for buildability
Procurement	Work structuring, pull scheduling, supplier training, partnership, kanban, work packaging, supplier managed inventories
Material Handling	5S, reduced batch sizes, elimination of packaging, just-in-time deliveries
Operation	First Run Studies, multiskilled craftworkers, Last Planner