

Department of Contracts  
Notre Dame Ravelin  
Floriana

To Heads of Department  
and Parastatal Bodies

23 July 2008

**READY MIXED CONCRETE FOR GENERAL / MARITIME USE (Lean Mix) -  
MALTA 2006 (North and South Region)**

1. Heads of Department and Accounting Officers are requested to note that the contract for the supply and delivery of Ready Mixed Concrete for General and Maritime Use has been placed with the contractor shown below at the prices indicated on the attached Schedules 'A', 'B', 'C' and 'D' for North and 'A', 'B', 'C', and 'D' for South and Schedule E for Lean Mix. Prices are inclusive of all charges and all taxes, including 18% VAT and delivery costs.

Żrar Ltd  
Bonniċi House  
Sardine Street  
Burmarrad

Tel: 21459780  
VAT No. 1052-8529

2. Payments are to be made direct to contractor.
3. This contract shall run up to the 30 June 2009.
4. The Specifications and Conditions regulating this contract are attached.
5. This contract is governed by the attached 'General Conditions of Contract for the Supply of Goods and Materials under a Running Period Contract.'

F Attard  
Director General (Contracts)

*enc.*

## STRUCTURAL CONCRETE MIX SCHEDULE 'A'

**NORTH REGION** - (Mellieħa, St. Paul's Bay, Mgarr, Mtarfa, Naxxar, Mdina, Burmarrad, Buġibba, Mosta, Magħtab, Rabat, Dingli, Lija, Balzan, Attard as well as the confines of their respective towns and villages)

MIX DESCRIPTION			Item 1	Item 2	Item 3	Item 4	Item 5
			REINFORCED CONCRETE				
Type of Mix			Designed	Designed	Designed	Designed	Designed
Type of Cement		To B.S.	12 (OP)	12 (OP)	12 (OP)	12 (OP)	12 (OP)
Type of Aggregate	Coarse	To B.S.	882, 1201	882, 1201	882, 1201	882, 1201	882, 1201
	Fine	To B.S.	882, 1201	882, 1201	882, 1201	882, 1201	882, 1201
Nominal Maximum Aggregate Size (mm)			20	20	20	20	20
Concrete Grade			C20	C25	C30	C35	C40
Minimum Cement Content		kg/m <sup>3</sup>	240	260	275	300	325
Sampling Rate		#/m <sup>3</sup>	20	20	20	20	20
Workability	Slump	mm	40-70	40-70	40-70	40-70	40-70
	Flow	mm					
Maximum Free Water / Cement Ratio			0.8	0.7	0.65	0.6	0.55
Admixtures	Prohibited		Yes	Yes	Yes	Yes	Yes
	Specified						
Density of Concrete	Minimum	kg/m <sup>3</sup>	2250	2250	2250	2250	2250

Mix Cement Content	kg/m <sup>3</sup>	304	330	362	395	441
Mix Fine Aggregate	kg/m <sup>3</sup>	791	762	731	701	665
Mix Coarse Aggregate	kg/m <sup>3</sup>	930	932	931	930	918
Water Content	l/m <sup>3</sup>	225	225	225	225	225
Admixtures	l/m <sup>3</sup>	0	0	0	0	0
Estimated Qty.*	m <sup>3</sup>	800	800	600	200	200
<b>Rate**</b>	<b>€/m<sup>3</sup></b>	<b>45.89</b>	<b>55.44</b>	<b>56.37</b>	<b>56.37</b>	<b>56.37</b>

- # Four cubes per sample: 2 tested at 7 days and 2 tested at 28 days
- N/A Not Applicable
- (a) Superplasticiser
- (b) Accelerating
- (c) Retarding
- (d) Water-Reducing
- (e) Air-entraining

\* Vide Clause 1.2 of the Preliminary Conditions

\*\* Rate quoted should be per cubic metre delivered inclusive of VAT, and other charges as applicable

## STRUCTURAL CONCRETE MIX SCHEDULE 'B'

**NORTH REGION** - (Mellieħa, St. Paul's Bay, Mgarr, Mtarfa, Naxxar, Mdina, Burmarrad, Buġibba, Mosta, Magħtab, Rabat, Dingli, Lija, Balzan, Attard as well as the confines of their respective towns and villages)

MIX DESCRIPTION			Item 1	Item 2	Item 3
			Designed	Designed	Designed
Type of Mix			12 (OP)	12 (OP)	12 (OP)
Type of Cement		To B.S.	882, 1201	882, 1201	882, 1201
Type of Aggregate	Coarse	To B.S.	882, 1201	882, 1201	882, 1201
	Fine	To B.S.	882, 1201	882, 1201	882, 1201
Nominal Maximum Aggregate Size (mm)			20	20	20
Concrete Grade			C30	C35	C40
Minimum Cement Content		kg/m <sup>3</sup>	275	300	325
Sampling Rate		#/m <sup>3</sup>	20	20	20
Workability	Slump	mm			
	Flow	mm	510-620	510-620	510-620
Maximum Free Water / Cement Ratio			0.65	0.6	0.5
Admixtures	Prohibited		No	No	No
	Specified		(a)	(a)	(a)
Density of Concrete	Minimum	kg/m <sup>3</sup>	2250	2250	2250

Mix Cement Content	kg/m <sup>3</sup>	350	400	450
Mix Fine Aggregate	kg/m <sup>3</sup>	740	788	719
Mix Coarse Aggregate	kg/m <sup>3</sup>	1100	820	880
Water Content	l/m <sup>3</sup>	160	217	203
Admixtures	l/m <sup>3</sup>	3	3	3
Estimated Qty.*	m <sup>3</sup>	400	500	200
<b>Rate**</b>	<b>€/m<sup>3</sup></b>	<b>56.37</b>	<b>56.37</b>	<b>56.37</b>

- # Four cubes per sample: 2 tested at 7 days and 2 tested at 28 days
- N/A Not Applicable
- (a) Superplasticiser
- (b) Accelerating
- (c) Retarding
- (d) Water-Reducing
- (e) Air-entraining

\* Vide Clause 1.2 of the Preliminary Conditions

\*\* Rate quoted should be per cubic metre delivered inclusive of VAT, and other charges as applicable

## STRUCTURAL CONCRETE MIX SCHEDULE 'C'

**NORTH REGION** - (Mellieħa, St. Paul's Bay, Mgarr, Mtarfa, Naxxar, Mdina, Burmarrad, Buġibba, Mosta, Magħtab, Rabat, Dingli, Lija, Balzan, Attard as well as the confines of their respective towns and villages)

MIX DESCRIPTION			Item 1	Item 2	Item 3
			MASS CONCRETE		
Type of Mix			Designed	Designed	Designed
Type of Cement		To B.S.	12 (OP)	12 (OP)	12 (OP)
Type of Aggregate	Coarse	To B.S.	882, 1201	882, 1201	882, 1201
	Fine	To B.S.	882, 1201	882, 1201	882, 1201
Nominal Maximum Aggregate Size (mm)			40	20	40
Concrete Grade			C15	C20	C20
Minimum Cement Content		kg/m <sup>3</sup>	175	180	150
Sampling Rate		#/m <sup>3</sup>	100	100	100
Workability	Slump	mm	40-70	40-70	40-70
Maximum Free Water / Cement Ratio			0.7	0.6	0.6
Admixtures	Prohibited		Yes	Yes	Yes
	Specified				
Density of Concrete	Minimum	kg/m <sup>3</sup>	2200	2200	2200

Mix Cement Content	kg/m <sup>3</sup>	310	379	362
Mix Fine Aggregate	kg/m <sup>3</sup>	869	832	873
Mix Coarse Aggregate	kg/m <sup>3</sup>	804	768	778
Water Content	l/m <sup>3</sup>	217	225	217
Admixtures	l/m <sup>3</sup>	0	0	0
Estimated Qty.*	m <sup>3</sup>	1200	1200	900
<b>Rate**</b>	<b>€/m<sup>3</sup></b>	<b>42.30</b>	<b>45.89</b>	<b>45.89</b>

- # Four cubes per sample: 2 tested at 7 days and 2 tested at 28 days  
 N/A Not Applicable  
 (a) Superplasticiser  
 (b) Accelerating  
 (c) Retarding  
 (d) Water-Reducing  
 (e) Air-entraining

\* Vide Clause 1.2 of the Preliminary Conditions

\*\* Rate quoted should be per cubic metre delivered inclusive of VAT, and other charges as applicable

## STRUCTURAL CONCRETE MIX SCHEDULE 'D'

**NORTH REGION** - (Mellieha, St. Paul's Bay, Mgarr, Mtarfa, Naxxar, Mdina, Burmarrad, Bugibba, Mosta, Maghtab, Rabat, Dingli, Lija, Balzan, Attard as well as the confines of their respective towns and villages)

MIX DESCRIPTION			Item 1	Item 2	Item 3
			UNDERWATER CONCRETE		
Type of Mix			Designed	Designed	Designed
Type of Cement		To B.S.	12 (OP)	12 (OP)	12 (OP)
Type of Aggregate	Coarse	To B.S.	882, 1201	882, 1201	882, 1201
	Fine	To B.S.	882, 1201	882, 1201	882, 1201
Nominal Maximum Aggregate Size (mm)			40	40	20
Concrete Grade			C20	C20	C25
Minimum Cement Content		kg/m <sup>3</sup>	350	350	350
Sampling Rate		#/m <sup>3</sup>	100	100	100
Workability	Slump	mm	125	125	
	Flow	mm			510-620
Maximum Free Water / Cement Ratio					
Admixtures	Prohibited		Yes	Yes	No
	Specified				(d)
Density of Concrete	Minimum	kg/m <sup>3</sup>	2300	2300	2300

Mix Cement Content	kg/m <sup>3</sup>	350	350	350
Mix Fine Aggregate	kg/m <sup>3</sup>	795	795	799
Mix Coarse Aggregate	kg/m <sup>3</sup>	932	932	976
Water Content	l/m <sup>3</sup>	255	225	175
Admixtures	l/m <sup>3</sup>	0	0	0
Estimated Qty. Malta *	m <sup>3</sup>	400	300	300
<b>Rate**</b>	<b>€/m<sup>3</sup></b>	<b>45.89</b>	<b>45.89</b>	<b>55.44</b>

- # Four cubes per sample: 2 tested at 7 days and 2 tested at 28 days  
 N/A Not Applicable  
 (a) Superplasticiser  
 (b) Accelerating  
 (c) Retarding  
 (d) Water-Reducing  
 (e) Air-entraining

\* Vide Clause 1.2 of the Preliminary Conditions

\*\* Rate quoted should be per cubic metre delivered inclusive of VAT, and other charges as applicable

## STRUCTURAL CONCRETE MIX SCHEDULE 'A'

**SOUTH REGION** - (B'Kara, Pembroke, St. Julians, Sliema, Gżira, San Ġwann, Manoel Island, Ta' Xbiex, Msida, Pieta, Marsa, Hamrun, Qormi, Żebbuġ, Siggiewi, Qrendi, Luqa, M'Xlokk, Paola, Gudja, Għaxaq, B'Buġia, Żejtun, Żabbar, Kottonera, Valletta and Floriana as well as the confines of their respective towns and villages)

MIX DESCRIPTION			Item 1	Item 2	Item 3	Item 4	Item 5
			REINFORCED CONCRETE				
Type of Mix			Designed	Designed	Designed	Designed	Designed
Type of Cement		To B.S.	12 (OP)	12 (OP)	12 (OP)	12 (OP)	12 (OP)
Type of Aggregate	Coarse	To B.S.	882, 1201	882, 1201	882, 1201	882, 1201	882, 1201
	Fine	To B.S.	882, 1201	882, 1201	882, 1201	882, 1201	882, 1201
Nominal Maximum Aggregate Size (mm)			20	20	20	20	20
Concrete Grade			C20	C25	C30	C35	C40
Minimum Cement Content		kg/m <sup>3</sup>	240	260	275	300	325
Sampling Rate		#/m <sup>3</sup>	20	20	20	20	20
Workability	Slump	mm	40-70	40-70	40-70	40-70	40-70
	Flow	mm					
Maximum Free Water / Cement Ratio			0.8	0.7	0.65	0.6	0.55
Admixtures	Prohibited		Yes	Yes	Yes	Yes	Yes
	Specified						
Density of Concrete	Minimum	kg/m <sup>3</sup>	2250	2250	2250	2250	2250

Mix Cement Content	kg/m <sup>3</sup>	304	330	362	395	441
Mix Fine Aggregate	kg/m <sup>3</sup>	791	762	731	701	665
Mix Coarse Aggregate	kg/m <sup>3</sup>	930	932	931	930	918
Water Content	l/m <sup>3</sup>	225	225	225	225	225
Admixtures	l/m <sup>3</sup>	0	0	0	0	0
Estimated Qty.*	m <sup>3</sup>	400	700	700	300	100
<b>Rate**</b>	<b>€/m<sup>3</sup></b>	<b>45.89</b>	<b>55.44</b>	<b>56.37</b>	<b>56.37</b>	<b>56.37</b>

- # Four cubes per sample: 2 tested at 7 days and 2 tested at 28 days
- N/A Not Applicable
- (a) Superplasticiser
- (b) Accelerating
- (c) Retarding
- (d) Water-Reducing
- (e) Air-entraining

\* Vide Clause 1.2 of the Preliminary Conditions

\*\* Rate quoted should be per cubic metre delivered inclusive of VAT, and other charges as applicable

## STRUCTURAL CONCRETE MIX SCHEDULE 'B'

**SOUTH REGION** - (B'Kara, Pembroke, St. Julians, Sliema, Gżira, San Ġwann, Manoel Island, Ta' Xbiex, Msida, Pieta, Marsa, Hamrun, Qormi, Żebbuġ, Siġġiewi, Qrendi, Luqa, M'Xlokk, Paola, Gudja, Għaxaq, B'Buġia, Żejtun, Żabbar, Kottonera, Valletta and Floriana as well as the confines of their respective towns and villages)

			Item 1	Item 2	Item 3
MIX DESCRIPTION					
Type of Mix			Designed	Designed	Designed
Type of Cement		To B.S.	12 (OP)	12 (OP)	12 (OP)
Type of Aggregate	Coarse	To B.S.	882, 1201	882, 1201	882, 1201
	Fine	To B.S.	882, 1201	882, 1201	882, 1201
Nominal Maximum Aggregate Size (mm)			20	20	20
Concrete Grade			C30	C35	C40
Minimum Cement Content		kg/m <sup>3</sup>	275	300	325
Sampling Rate		#/m <sup>3</sup>	20	20	20
Workability	Slump	mm			
	Flow	mm	510-620	510-620	510-620
Maximum Free Water / Cement Ratio			0.65	0.6	0.5
Admixtures	Prohibited		No	No	No
	Specified		(a)	(a)	(a)
Density of Concrete	Minimum	kg/m <sup>3</sup>	2250	2250	2250

Mix Cement Content	kg/m <sup>3</sup>	350	400	450
Mix Fine Aggregate	kg/m <sup>3</sup>	740	788	719
Mix Coarse Aggregate	kg/m <sup>3</sup>	1100	820	880
Water Content	l/m <sup>3</sup>	160	217	203
Admixtures	l/m <sup>3</sup>	3	3	3
Estimated Qty.*	m <sup>3</sup>	400	500	200
<b>Rate**</b>	<b>€/m<sup>3</sup></b>	<b>56.37</b>	<b>56.37</b>	<b>56.37</b>

- # Four cubes per sample: 2 tested at 7 days and 2 tested at 28 days
- N/A Not Applicable
- (a) Superplasticiser
- (b) Accelerating
- (c) Retarding
- (d) Water-Reducing
- (e) Air-entraining

\* Vide Clause 1.2 of the Preliminary Conditions

\*\* Rate quoted should be per cubic metre delivered inclusive of VAT, and other charges as applicable

## STRUCTURAL CONCRETE MIX SCHEDULE 'C'

**SOUTH REGION** - (B'Kara, Pembroke, St. Julians, Sliema, Gzira, San Ġwann, Manoel Island, Ta' Xbiex, Msida, Pieta, Marsa, Hamrun, Qormi, Żebbuġ, Siġġiewi, Qrendi, Luqa, M'Xlokk, Paola, Gudja, Għaxaq, B'Buġia, Żejtun, Żabbar, Kottonera, Valletta and Floriana as well as the confines of their respective towns and villages)

MIX DESCRIPTION			Item 1	Item 2	Item 3
			MASS CONCRETE		
Type of Mix			Designed	Designed	Designed
Type of Cement		To B.S.	12 (OP)	12 (OP)	12 (OP)
Type of Aggregate	Coarse	To B.S.	882, 1201	882, 1201	882, 1201
	Fine	To B.S.	882, 1201	882, 1201	882, 1201
Nominal Maximum Aggregate Size (mm)			40	20	40
Concrete Grade			C15	C20	C20
Minimum Cement Content		kg/m <sup>3</sup>	175	180	150
Sampling Rate		#/m <sup>3</sup>	100	100	100
Workability	Slump	mm	40-70	40-70	40-70
Maximum Free Water / Cement Ratio			0.7	0.6	0.6
Admixtures	Prohibited		Yes	Yes	Yes
	Specified				
Density of Concrete	Minimum	kg/m <sup>3</sup>	2200	2200	2200

Mix Cement Content	kg/m <sup>3</sup>	310	375	362
Mix Fine Aggregate	kg/m <sup>3</sup>	869	852	843
Mix Coarse Aggregate	kg/m <sup>3</sup>	804	768	778
Water Content	l/m <sup>3</sup>	217	225	217
Admixtures	l/m <sup>3</sup>	0	0	0
Estimated Qty.*	m <sup>3</sup>	1200	1400	1400
<b>Rate**</b>	<b>€/m<sup>3</sup></b>	<b>45.30</b>	<b>45.89</b>	<b>45.89</b>

- # Four cubes per sample: 2 tested at 7 days and 2 tested at 28 days  
 N/A Not Applicable  
 (a) Superplasticiser  
 (b) Accelerating  
 (c) Retarding  
 (d) Water-Reducing  
 (e) Air-entraining

\* Vide Clause 1.2 of the Preliminary Conditions

\*\* Rate quoted should be per cubic metre delivered inclusive of VAT, and other charges as applicable



## STRUCTURAL CONCRETE MIX SCHEDULE 'D'

**SOUTH REGION** - (B’Kara, Pembroke, St. Julians, Sliema, Gzira, San Ġwann, Manoel Island, Ta’ Xbiex, Msida, Pieta, Marsa, Hamrun, Qormi, Żebbuġ, Siġġiewi, Qrendi, Luqa, M’Xlokk, Paola, Gudja, Għaxaq, B’Buġia, Żejtun, Żabbar, Kottonera, Valletta and Floriana as well as the confines of their respective towns and villages)

MIX DESCRIPTION			Item 1	Item 2	Item 3
			UNDERWATER CONCRETE		
Type of Mix			Designed	Designed	Designed
Type of Cement		To B.S.	12 (OP)	12 (OP)	12 (OP)
Type of Aggregate	Coarse	To B.S.	882, 1201	882, 1201	882, 1201
	Fine	To B.S.	882, 1201	882, 1201	882, 1201
Nominal Maximum Aggregate Size (mm)			40	40	20
Concrete Grade			C20	C20	C25
Minimum Cement Content		kg/m <sup>3</sup>	350	350	350
Sampling Rate		#/m <sup>3</sup>	100	100	100
Workability	Slump	mm	125	125	
	Flow	mm			510-620
Maximum Free Water / Cement Ratio					
Admixtures	Prohibited		Yes	Yes	No
	Specified				(d)
Density of Concrete	Minimum	kg/m <sup>3</sup>	2300	2300	2300

Mix Cement Content	kg/m <sup>3</sup>	350	350	390
Mix Fine Aggregate	kg/m <sup>3</sup>	795	795	799
Mix Coarse Aggregate	kg/m <sup>3</sup>	932	932	976
Water Content	l/m <sup>3</sup>	225	225	175
Admixtures	l/m <sup>3</sup>	0	0	0
Estimated Qty. Malta *	m <sup>3</sup>	400	300	300
<b>Rate**</b>	<b>€/m<sup>3</sup></b>	<b>45.89</b>	<b>45.89</b>	<b>55.44</b>

- # Four cubes per sample: 2 tested at 7 days and 2 tested at 28 days  
 N/A Not Applicable  
 (a) Superplasticiser  
 (b) Accelerating  
 (c) Retarding  
 (d) Water-Reducing  
 (e) Air-entraining

\* Vide Clause 1.2 of the Preliminary Conditions

\*\* Rate quoted should be per cubic metre delivered inclusive of VAT, and other charges as applicable

## LEAN MIX SCHEDULE 'E'

**NORTH REGION** - (Mellieħa, St. Paul's Bay, Mgarr, Mtarfa, Naxxar, Mdina, Burmarrad, Buġibba, Mosta, Magħtab, Rabat, Dingli, Lija, Balzan, Attard as well as the confines of their respective towns and villages)

	<b>Estimated Quantity</b>	<b>Unit Rate</b> €/m <sup>3</sup> **
Item 1 -	1500 Cubic Metres *	<hr/> <b>15</b>

**SOUTH REGION** – (B'Kara, Pembroke, St. Julians, Sliema, Gżira, San Ġwann, Manoel Island, Ta' Xbiex, Msida, Pieta, Marsa, Hamrun, Qormi, Żebbuġ, Siġġiewi, Qrendi, Luqa, M'Xlokk, Paola, Gudja, Ghaxaq, B'Buġia, Żejtun, Żabbar, Kottonera, Valletta and Floriana as well as the confines of their respective towns and villages)

	<b>Estimated Quantity</b>	<b>Unit Rate</b> €/m <sup>3</sup> **
Item 2 -	1500 Cubic Metres *	<hr/> <b>15</b>

\* Vide Clause 1.2 of the Preliminary Conditions

\*\* Rate quoted shall be per cubic metre delivered inclusive of VAT and all other charges as applicable

## **2. TECHNICAL CONDITIONS**

### **2.1 DEFINITIONS.**

For the purpose of this tender, definitions given in BS 5328 and BS 6100 are deemed to apply.

Producer will be deemed to imply any person or firm entering into a contract to supply concrete.

Purchaser will be deemed to be any person or firm entering into a contract to buy concrete.

Engineer is the engineer who acts on behalf of the Purchaser.

### **2.2 CERTIFICATES**

When, submitting his tender, and when requested by the purchaser, a producer is to produce the following documents:-

- a. The nature and source of each constituent material;
- b. The source of supply of concrete and any proposed alternative sources;
- c. A recent test report on the aggregates to be used in the mix including a sieve analysis of each aggregate type dated within the tendering period;
- d. A certificate or test report stating that the cement complies with the appropriate British Standard.
- e. The proposed proportions or quantity of each constituent per cubic metre of fully compacted concrete;
- f. Details of admixtures, if any are to be used. The producer shall provide the following information:
  1. the typical dosage and details of the effects of underdosage and overdosage;
  2. the generic type(s) of the main active constituent(s) in the admixture;
  3. whether or not the admixture contains chlorides and, if so, the chloride content of the admixture expressed as a percentage of chloride ion by mass of admixture;
  4. whether or not the admixture leads to the entrainment of air when used in the proposed dosage;
  5. where more than one (1) admixture is used, data on their interaction and compatibility.
- g. Evidence of suitability of the proposed mix proportions to meet the specified requirements.

It may also be required that independent testing be carried out at the discretion of the purchaser to guarantee the conditions specified by this tender. The extent, liability and type of test shall be mutually agreed between the producer and purchaser prior to commencement of testing. In the event that the producer refuses to allow testing of any concrete, the concrete in question will be assumed to be below grade and rejected.

### 2.3 OPTIONAL REQUIREMENTS

When evidence is requested to verify the adequacy of the proposed mix proportions to meet the specified performance conditions, this generally shall be data from previous production of concrete using the materials and plant which will be used to produce the concrete, confirming that the proposed mix proportions satisfy.

It is recommended that the producer adopts the maintenance routines outlined in Section 3: Appendix A, *Routine Maintenance Checks for Plant and Equipment*.

### 2.4 SAMPLING

The purchaser concerned reserves the right to take samples of any or all the constituent materials in a mix from a producer and test them in accordance to the tests stipulated in the technical conditions, before awarding the contract. The purchaser may also require a producer to furnish evidence that he has the ability to supply concrete in the quantities expected and to maintain the quality of the product.

When sampling a batch or load of ready mixed concrete, three (3) samples shall be taken during discharge from the first part, the middle part and the last part of the load. The three (3) samples shall be mixed on a non-absorbent base to form the composite sample.

### 2.5 POOR QUALITY

If the concrete delivered under the contract is found to fail to satisfy the specification requirements, the purchaser may order the rate of payment to be reduced. If however, the concrete is of such poor quality that the purchaser considers its characteristics to be seriously impaired, then the concrete may be rejected, in which case the contractor will become liable to the penalties as provided for in the contract.

## 2.6 WORKABILITY

Two (2) workability tests shall be carried out on the composite sample. The load of concrete represented by this sample shall be considered to have satisfied the compliance requirement if the average of the results of the two (2) tests lies within the following tolerances of the specified value:

Slump +/- 25mm or +/- one-third ( $\frac{1}{3}$ ) of the required value, whichever is the greater.

Compacting Factor

+/- 0.03 where required value is 0.90 or more,  
+/- 0.04 where required value is between 0.80 and 0.90,  
+/- 0.05 where required value is 0.80 or less.

## 2.7 MIXING

The cement and the aggregate shall be mixed together - either in the proportions described in the tendered mix design or as required by the purchaser. Mixing may be carried out at a batching plant or in a truck mixer. Mixing time is measured from the time all materials, including water, are in the drum of the mixer; where no uniformity tests have been carried out, this should be not less than 2 minutes. For concrete mixed in truck mixers, mixing should continue for not less than 100 revolutions of the truck mixer drum at a rate not less than 7 revolutions a minute (i.e. about 10 to 15 minutes).

## 2.8 VARIATIONS

The Head of Department reserves the right to specify variations in the mix design parameters specified throughout the contract and for his representatives to take samples and test cubes from the concrete as it is delivered to the sites. The contractor shall be required to furnish test moulds and provide all necessary help to ensure an accurate assessment supplied.

## 2.9 CHANGES IN MATERIALS

The producer shall provide the purchaser with details of any proposed changes in the source or nature of any of the constituent materials made during the period of concrete production. Acceptance of any such changes is at the discretion of the purchaser or his agent.

## 2.10 ENGINEER'S AUTHORITY

The Engineer shall upon arrival of material and after, have power to order:

- a. The contractor to break up and remove from site at his expense within fifteen (15) days any concrete which is not according to the specification and substitution by proper and suitable concrete.
- b. Final payment will be effected as soon as it made known (but not before twenty-eight (28) days), by the Quality Control Section of the Purchaser, that the concrete of the particular pour satisfies the minimum test requirements as set out in the Technical Conditions. The contractor shall incur a penalty of LM75 for every truckload of ready-mixed concrete not in accordance with the specifications. Moreover he shall not be paid for the concrete supplied and represented by the failed sample/s and become liable for the cost of replacement of the failed concrete together with any damages which government may suffer through such default.

## 2.11 DELIVERY

The concrete shall be delivered on the day at the time and place as directed by the Engineer provided that at least 24 hours notice is given. The contractor may be required to deliver up to 500 cubic metres per day even after normal working hours. It is also expected that limited deliveries shall be required on Saturdays, Sundays, Holidays of Obligation and Public Holidays. Claims for waiting time or overtime after or before working time shall not be entertained.

Where a truck mixer is used for transporting concrete, the discharge shall be completed within two hours after contact between the cement and water, either as mixing water or water contained in the damp aggregates, unless a longer time is authorised by the purchaser. The time of contact between the cement and water shall be the loading time recorder on the delivery ticket.

Where concrete is transported in non-agitating equipment, discharge shall be complete within one hour after mixing, unless a longer time is authorised. The time at which mixing was completed shall be the loading time recorded on the delivery ticket.

Where a truck mixer is used for transporting mixed concrete, the concrete shall either be agitated during transit, or remixed for not less than 10 revolutions of the truck mixer drum at the site.

## 2.12 QUANTITY OF CONCRETE

The basis of supply shall be by the cubic metre of fresh, fully compacted concrete. The volume of a given batch of concrete shall be calculated from the total mass of the batch divided by the mass per cubic metre of fresh, fully compacted concrete determined in accordance with BS 1881:Part 107. The total mass of the batch shall either be calculated as the sum of the masses of all materials used including water or be determined from the gross and tare weights of the vehicle on a weighbridge. The government at any time can request the total mass of the batch to be verified on a weighbridge close to the site of works.

## 2.13 TRANSPORTATION

Concrete shall be transported in a truck mixer unless the purchaser agrees to the use of non-agitating vehicles. When non-agitating vehicles are used, the mixed concrete shall be protected from gain or loss of water. Truck mixers, used either as mixers or agitators for transporting concrete, should comply with BS 3963: Method for testing the mixing performance of Concrete Mixers.

## 2.14 CONDITION OF MIXERS

All vehicles to be used to transport concrete shall be approved by the purchaser and any maintenance or modifications requested by the purchaser prior to approval, shall be inspected before acceptance for use. Central and truck-type mixers shall be maintained in an efficient and clean condition with no appreciable build-up hardened cement or concrete in the mixing drum, on the mixing blades, or on the loading hopper or discharge chutes. When, due to wear, the height or depth of the mixing blades is less than two-thirds of the original, the blade or paddles shall be renewed or replaced.

The producer shall afford any assistance to the purchaser to carry out all necessary inspections of the delivery of the concrete at the purchaser's discretion.

## 2.15 DELIVERY TICKET

Before discharging the concrete at the point of delivery, the supplier shall provide the Engineer or his representative with a delivery ticket for each batch of concrete on which is printed, stamped or written the following minimum information:

- (a) the name or number of the ready-mixed concrete depot;
- (b) the serial number of the ticket;
- (c) the date;
- (d) the truck number;
- (e) the name of the purchaser;
- (f) the name and location of the site;
- (g) the grade or mix description of the concrete;
- (h) the specified workability;
- (i) the minimum cement content, if specified;
- (j) the type of cement
- (k) the limiting proportions of pfa, if specified;
- (l) the maximum free water/cement ration, if specified;
- (m) the nominal maximum size of aggregate;
- (n) the type and name of admixture, if included;
- (o) the quantity of concrete in cubic metre;
- (p) the time of loading.

The following information shall be added to the delivery ticket on site:

- (q) the time of completion of discharge;
- (r) the water added to meet the specified workability;
- (s) the extra water added at the request of the purchaser of the concrete, or his representative, and his signature.

Unsigned, unreceipted or incomplete delivery tickets shall not be accepted for payment purposes.

Upon request, the contractor shall provide the government with additional information concerning the mix, including the following:

- (i) weight of cement in kilograms per cubic metre of concrete
- (ii) weights of fine and coarse aggregate in kilograms per cubic metre of concrete
- (iii) water content in litres per cubic metre of concrete.



## 2.16 CHECKING

Should any doubts arise regarding quantities supplied, the Engineer in charge reserves the right to disregard the quantities indicated in the delivery ticket (although this is signed by the purchaser) and payment to producer shall be made on the basis of the actual measurements on site.

## 2.17 SUPERVISOR AT PLANT

The Government reserves the right to despatch to the successful tenderer's plant his representative to continually check that the mix and amounts being delivered in each truck fully comply to the specifications laid out in this contract. Every facility must be provided by the producer so that this representative would be able to carry out his work.

## 2.18 PENALTY FOR DELAY

Should the contractor fail, refuse, or neglect to supply concrete within the period prescribed on the requisition he shall be liable for the whole period and on account of the delay, to a penalty of €50 per day in respect of each truckload of concrete up to that day on which delivery shall have been completed. The Government shall moreover without prejudice to the payment of the fines to which the contractor may have become liable and without the necessity of any prior legal proceedings have the right to order from other sources, at its discretion, such concrete at any price on account and at the contractor's expense.

## 2.19 QUANTITIES

The quantities indicated on the schedule are only indicative and the producer would still be bound to continue supplying up to the end of the contract period should this amount be exceeded.

## 2.20 CEMENT

Cements used shall comply with the following British Standards:

Ordinary Portland Cement	BS12
Rapid-hardening Portland Cement	
White Portland Cement	
Coloured Portland Cement	
Sulphate-resisting Portland Cement	BS4027
Portland-blast furnace Cement	BS146
Low heat Portland Cement	BS1370

Low heat Portland-blast furnace Cement	BS4246
High Alumina Cement	BS915
Supersulphated Cement	BS4248

Where cements other than those complying with BS12 and BS146 are used, account should be taken of their properties and any particular conditions of use.

Separate storage for different types of cement must be provided, bins or silos must be weather proof and permit free flow and efficient discharge of the cement.

Cement contents in excess of  $550 \text{ kg/ m}^3$  should not be used unless special consideration has been given in design to the increased risk of cracking due to drying shrinkage in thin sections or to thermal stresses in thicker sections, and to the increased risk of damage due to alkali silica reaction.

*In the case of marine concrete, mix proportions may be adapted from those which are known to give the required strength at the workability appropriate for concreting the dry by increasing the cement content by 25%. This enables adequate properties to be achieved with increased workability and offsets any losses of cement due to washing out Mixes should normally have a cement content of at least  $350 \text{ kg/m}^3$ .*

*The best method of ensuring that the natural alkaline protective mechanism is maintained is by providing concrete which has the lowest possible permeability and this can be obtained by adopting mixes designed to produce a concrete of the highest practicable density. Care should be taken that requirements for high strength and low permeability do not result in the workability being restricted to less than required for compaction.*

*In warm and polluted waters the use of sulphate resisting Portland cement is suggested.*

## 2.21 STRENGTH OF CONCRETE

For concrete mixes specified in terms of characteristic strength, tests shall be carried out on cubes prepared and tested in accordance with BS 1881. Each cube shall be made from a single sample taken from a randomly selected batch of concrete. The samples should be taken at the point of discharge from the mixer, or in the case of ready mixed concrete at the point of discharge from the delivery vehicle.

## 2.22 COMPLIANCE

Compliance with the specified characteristic strength may be assumed if:

1. the average strength determined from any group of four consecutive test cubes exceeds the specified characteristic strength by not less than 0.5 times the 'current margin'. (The 'current margin' is equivalent to at least 1.64 times the standard deviation for the production facility)
2. each individual test result is greater than 85 per cent of the specified characteristic strength.
3. the chloride content in the concrete shall not exceed the limits set in BS 8110 Part 1
4. where admixtures are used, they should comply with the requirements set in BS 8110, with strict adherence to the limits of chloride ion content.

The 'current margin' should be taken to be two-thirds of the specified characteristic strength for concrete of grade 7.5, 10 or 15N/mm<sup>2</sup> for concrete of grade 20 or above, unless a smaller margin has been established to the satisfaction of the engineer.

## 2.23 WATER

Water shall be clean and free from impurities to have a harmful effect on concrete. If there is doubt concerning its suitability for making concrete, tests shall be carried out in accordance with BS 3148 Tests for water for making concrete.

No water, other than any amount required to produce the specified workability, shall be added to the truck mixer drum before discharge unless specifically required and signed for by the purchaser. The water added shall be recorded on the delivery ticket.

The water/cement ratio of a batch of concrete should not exceed the specified maximum value by more than 5 per cent of that value.

## 2.24 AGGREGATE

In general aggregates should comply with one of the following British Standards: Aggregates from natural sources for concrete (including granolithic) BS 882, BS1201

The engineer may specify or approve on request the use of other aggregate including types or gradings not covered by one of the above British Standards, provided there are satisfactory data on the properties of concrete made with them.

The various sizes of aggregates shall be stored in separate bins or heaps so that there is no possibility of intermixing or contamination. All aggregates and cement used in the mix are to be batched by weight. 'Volume batching' will not be permitted in this contract.

For most work, 20mm aggregate is suitable. Where there are no restrictions to the flow of concrete into sections, 40mm or larger sized aggregate is permitted. In concrete elements with thin sections, closely spaced reinforcement or small cover, consideration should be given to the use of 10mm nominal maximum size.

*Materials for underwater concrete should comply with the same general requirements as for normally placed concrete which is subject to the same environment. Because of the requirements of high workability, rounded aggregates are preferred and crushed fine aggregates should be avoided because their particle shape and grading are usually unsuitable.*

*The usual principles of mix design apply to underwater concrete. Maximum aggregate size should be as large as possible, consistent with the need to avoid obstructing flow in delivery pipes. In tremie work, maximum size should only exceed 40mm in large pours when large diameter tremie is used. Concrete should be wet by normal standards and a slump of 125mm is necessary when measured in the dry.*

## 2.25 AGGREGATE QUALITY

The aggregates are to be from an approved source and will normally be from first quality crushed coralline limestone. The aggregates are to be dense, durable crystalline stone, with only limited porosity, free from any fine dust, from adhering concrete residues, organic matter and other impurities. Qualitative tests are to be carried out on all aggregates in accordance with BS 812 and must have the following properties:

- |    |                          |                   |
|----|--------------------------|-------------------|
| a) | Aggregate Crushing Value | Not more than 30% |
| b) | Flakiness Index          | Not more than 30% |
| c) | Water Absorption         | Less than 8%      |

## 2.26 ADMIXTURES

Admixtures shall only be used when specified by the engineer. Admixtures should comply with BS 5075 Part 1 - 3. Other admixtures may be used provided there are satisfactory data on the properties of the type of concrete made with them. Admixtures should not impair the durability of the concrete nor combine with the constituents to form harmful components nor increase the risk of the reinforcement.

## 2.27 SAMPLING FOR COMPLIANCE TESTING

Rate of sampling for strength compliance testing should be in accordance with Table 15 and clause 8.2, BS 5328 Part 1:1990. The actual rate of sampling may be increased in appropriate circumstances such as critical elements.

## 2.28 TESTING FOR ACCEPTANCE AND COMPLIANCE

The normal requirements for acceptance for ready mixed concrete are based on workability tests and strength tests are carried out in accordance with BS 1881.

Where necessary, the purchaser shall specify to the producer:

- (a) any special cements that shall or may be used;
- (b) any limits on the proportion of substitute materials such as pulverized fuel ash (pfa);
- (c) any special requirements for aggregates;
- (d) the type (s) of admixture specified or prohibited and the performance or quantity required;
- (e) the details of any test procedure(s) and the method(s) of assessing compliance if not specifically covered by this tender;
- (f) any other requirements.

## 2.29 QUALITY CONTROL PROCEDURES

Testing of Materials

*Cement:*

- (a) test certificates shall be obtained from the cement manufacturer at regular intervals.
- (b) continuous records and control charts of all cement tests shall be kept available for inspection.

*Aggregates:*

- (a) Sieve analysis and specific gravity tests on all aggregate sizes and types used, and organic impurities and field settling tests on the sands used shall be carried out initially and when a new source of supply is used. Thereafter, sieve analysis and field settling tests shall be carried out at least once each week to assess the variations from the assumed average values. The test methods shall be generally in accordance with BS 812 *Methods for sampling and testing of mineral aggregates, sands and fillers*.
- (b) Continuous records and control charts of all aggregate tests shall be kept available for inspection.

## 2.30 CONCRETE CONTROL TESTS

*Compressive strength*

- (a) For grades of concrete normally produced, cubes shall be made, cured and test at 28 days, and at an earlier age, from batches of concrete randomly sampled at the place of deposit, generally in accordance with BS 1881 *Methods of testing concrete*. When a central or stationary mixer is used for the complete mixing of the concrete, cubes may be sampled from the mixer in accordance with B.S. 1881.
- (b) Concrete mixers shall be randomly sampled and tested on at least 80% of the full working days in each month during which concrete is produced.

*Workability tests*

A slump test shall be performed on a sample of concrete on each and every occasion that cube specimens are made.

*Records*

Continuous records and control charts of all concrete tests shall be kept available for inspection and certificates shall be provided where required.

## 2.31 LABORATORIES

- (a) Control testing by ready mixed concrete producers shall be permitted, provided their quality control procedures, Laboratories and staff are approved by the producer and the necessary test apparatus is available to carry out the specified tests on materials, concrete and equipment.
- (b) Where producers make use of independent laboratories or test houses, these must be approved by the purchaser.

## 3. **APPENDIX A - ROUTINE MAINTENANCE CHECKS FOR PLANT AND EQUIPMENT**

### 3.1 STORAGE AND HANDLING EQUIPMENT

*Weekly routine* Check area under plant for spillage and trace source. Clean up yard, checking that all drains and traps are clear. Maintain settlement pits and wash-down in efficient working order. Check all storage bins and doors for efficient operation. Check conveyors and bucket elevators for free-running and wear, and adjust as necessary. Routine checks and servicing on loading shovels. Routine checks and servicing on compressors. Report any defects.

### 3.2 BATCHING AND MIXING EQUIPMENT

*Daily routine* Adjust tare weights and clean weighing dials. Ensure weighing hoppers empty properly. Wash out central mixer drum or pan.

*Weekly routine* Maintain all hoppers and doors in clean and efficient working order. Check central mixer blades, paddles or arms for wear and tightness and adjust as necessary. Remove any cement or concrete build-up in mixer. Shake out cement silo filter sock and maintain in efficient working order. Check dust seals on cement hoppers for wear. Clean knife edges on weighing equipment. Check calibration of moisture meter. Check oil levels on air line lubricators. Drain water traps on air lines. Check rams and air lines for leaks. Check pipework for leaks and wear. Check wiring and electrical apparatus for correct operation and overheating. Routine greasing of bearings and gears. Routine checks and serving on central mixers. Report any defects.

*Monthly Routine*

- Check calibration of all weight scales
- Check calibration of water meter
- Check calibration of admixture dispenser

*Quarterly Routine*                      Inspection and testing of all weigh scales over their complete range  
Routine oil changes in gear boxes and oil baths

### 3.3        TRANSPORTING EQUIPMENT - VEHICLE CHASSIS

It is the responsibility of the producer to maintain all vehicle chassis in accordance with the relevant Commissioner of Police Regulations.

### 3.4        TRANSPORTING EQUIPMENT - MIXER AND AGITATOR UNIT

*Daily Routine*                              Wash out truck mixer drum.

*Monthly Routine*                            Check mixer unit for blade wear.  
Check operation of revolution counters.  
Check calibration of truck water meter.  
Report any defects.

## **Specification for the Manufacture, Use and Testing of Lean Mix**

### **A.        Background**

Lean mix is essentially a recently developed alternative reinstatement material for use in road construction and reconstruction. Such materials allow more rapid, reliable and cost-effective reinstatements, with less dependence on the skill and physical effort of the operators. These materials essentially also offer significant environmental or practical advantages, and/or cost benefits, compared with conventional materials, including various combinations of the following:

- a) Reduced usage of virgin materials, by including recycled, secondary or waste materials;
- b) Lower energy requirements during manufacture;
- c) Reduced landfill requirements during construction or reconstruction;
- d) Self-cementing properties to improve reliability of laying and compaction;
- e) Self-levelling or flowable, to avoid need for compaction;
- f) May be placed in fewer layers.

Lean mix is therefore a Structural Material for Reinstatements (SMRs) and falls into a category of alternative bound reinstatement materials that include a cementitious, chemical or hydraulic binder or are inherently self-cementing. It is also a Flowable SMRs (FSMRs) which group comprise of any type and



combination of aggregates and binders. They are flowable mixes that should not normally require compaction.

SMRs may be used, by prior agreement, in any combination of the following, regardless of the nature of reinstatement materials used above and below:

- a) At any position within the surround to apparatus and/or backfill, as the entire layer or combined with any other permitted backfill materials, in any proportion, within any reinstatement;
- b) As a sub-base, within any reinstatement;
- c) As combined sub-base and base (roadbase) within any reinstatement;
- d) As combined sub-base and binder course, within any reinstatement in footways, footpaths and cycletracks.

SMRs shall not be used in place of surface course materials.

## **B. Material Production**

FSMRs shall be prepared in accordance with the procedures set out in the agreed manner, to the approved mix formulation(s) (obtained by prior development and testing), to achieve the required compressive strength. Binders, additives and admixtures may be included as agreed and based on prior development and testing.

FSMRs may be delivered to site as ready-made materials or be prepared partly or wholly on site.

Mixing may be carried out using any equipment, adapted as necessary for the manufacture of FSMRs in quantities appropriate to the intended usage, provided the approved mixing procedure is used throughout. Mixing equipment should be maintained in accordance with the manufacturer's recommendations and checked regularly. All metering and weighing apparatus should be calibrated regularly.

All binders, additives and admixtures, including diluted solutions thereof, should be stored according to the manufacturer's recommendations and used within the recommended shelf life.

Suggested mix design compositions for lean mix for use in trenching and reinstatement of roads could have the following characteristics:

1. Grading for 0/9.5:

Particle size	Cumulative % passing
9.55mm	100
4mm	61-74
2mm	36-57
1mm	21-42
0.25mm	5-11

2. Cement content: 3-5%
3. Water / cement content 2.5-3.0
4. Compressive strength: 0.5 N/mm<sup>2</sup>

It is to be noted that these mix characteristics are suggested only as a starting point for mix development and therefore the final agreed mix will only be accepted after the results of tests carried out on the cubes or appropriate trial mixes have been submitted to the Engineer for evaluation and approval.

**C. Testing**

- 1) The compressive strength shall be determined in accordance with the principles of BS 1881: part 116 or Part 120, with the following exceptions or options:
- a) Test specimens may be prepared at the time of placement by casting within a test mould, or recovered from site after placement by the extraction of cores from the reinstatement;
- b) Cast specimens may be conventional test cubes with a nominal side length of 150mm, or they may be cylindrical with a diameter in the range 150-300mm and an aspect ratio of 1.0. Moulds may be manufactured from cellular foam (preferably polystyrene) and include a cellular foam lid. The samples shall not be compacted, except for minimal tamping to allow the mould to be filled without leaving excessive regions of voidage;
- c) Core test specimens shall be cylindrical, with a diameter in the range 150 – 300mm and an aspect ratio of 1.0. The top and bottom surfaces of the test specimen may be grouted to ensure flat, parallel loading surfaces;

- d) Following preparation or recovery, the test samples shall be stored upright, at ambient temperature until 90 days have elapsed from the placement of the material on site. Accelerated curing at temperatures exceeding 25°C is not permitted.
- 2) Experience suggests that results obtained from 150mm test cubes, in lidded cellular foam moulds, stored at ambient temperature, within the mould, are most representative of in-ground conditions.

**D. Particular Requirements**

FSMRs shall not normally be tamped or otherwise compacted.

FSMRs of density less than 1000 kg/cu. m. may not displace standing water.