

Figure A.1 Optimization of firing time for crushing strength and porosity of fired bricks samples

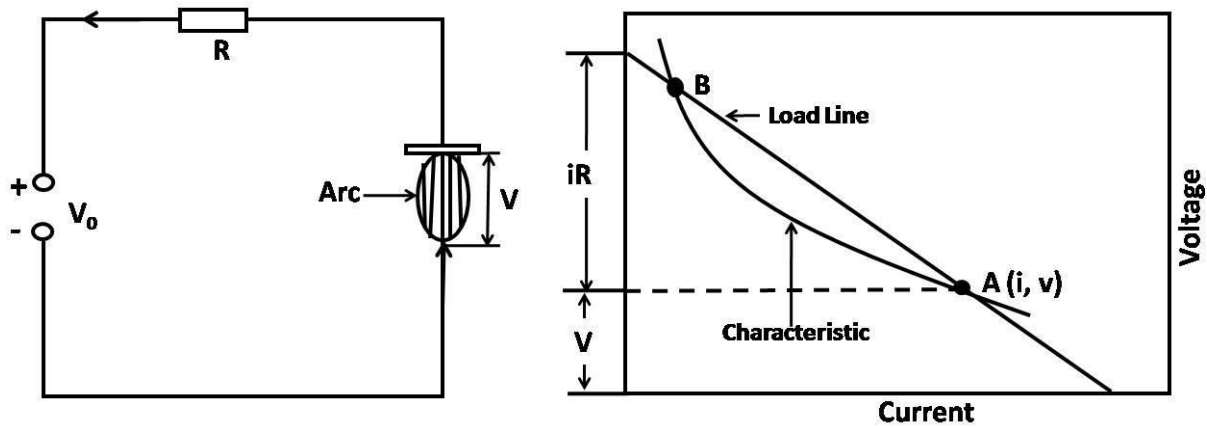


Figure A.2 Falling trends characteristics of increased arc conductance with increasing current

Calculation of conductance

From the above circuit diagram, Conductance (σ) = $(I \times L) / (V \times A)$; $\Omega^{-1}m^{-1}$

Where: I=arc current; L= Arc length; V=Arc voltage; A=Area

Conductance is calculated and values are shown in table below

Appendix-B

Table B.1 Categories of base soil as per IS 9429

Category	Percent finer than 75 micron
1	>85
2	40-85
3	15-39
4	<15

Table B.2 D₁₅ criteria for Filters as per IS 9429

Base Soil Category	Filter Criteria
1	$D_{15}(F) \leq 9D_{85}(B) \geq 0.2 \text{ mm}$
2	$D_{15}(F) \leq 0.7 \text{ mm}$
3	$D_{15}(F) \leq \left[\frac{(40-A)}{(40-15)} \right] \times [4D_{85}(B)-0.7\text{mm}]+0.7 \text{ mm}$
4	$D_{15}(F) \leq 4D_{85}(B)$

Table B.3 Limits of D₁₀(F) and D₉₀(F) for preventing segregation as per IS 9429

D ₁₀ (F) (Minimum) (mm)	D ₉₀ (F) Maximum (mm)
<0.5	20
0.5-1.0	25
1.0-2.0	30
2.0-5.0	40
5.0-10	50
10-50	60

Appendix-B

Table B.4 Requirement of different properties of building bricks as per ASTM C62 standard

Designation	Maximum compressive strength (MPa)	Maximum water absorption (%)
Grade SW	17.2	25
Grade MW	15.2	25
Grade NW	8.6	No limit

Table B.5 Requirement of different properties of insulation bricks as per IS2042 standard

Characteristic	Grade A	Grade B	Grade C
Apparent porosity (min), (%)	60	60	65
Cold crushing strength (min) (MPa)	2	1.5	0.7
Permanent Linear Change (PLC) (max) (%)	1.5	1.5	2.0
Thermal conductivity at 600°C (w/mk) Max	0.52	0.35	0.28
Bulk density (kg/m ³)	1000	900	750

Table B.6 Thermal conductivity measured at different measuring temperature

Bottom ash type	Iron ore slime (%)	Thermal conductivity (W/mK)											
		Measuring temperature (°C)				200	400	600	800	200	400	600	800
PCC	10	0.12	0.26	0.31	0.34	0.155	0.28	0.33	0.35	0.18	0.31	0.35	0.42
	30	0.15	0.31	0.35	0.37	0.18	0.33	0.37	0.382	0.3	0.38	0.45	0.47
	50	0.232	0.375	0.435	0.453	0.283	0.403	0.453	0.465	0.452	0.502	0.522	0.695
FBC	10	0.156	0.405	0.437	0.515	0.295	0.53	0.502	0.582	0.594	0.685	0.705	0.758
	30	0.2	0.42	0.45	0.54	0.31	0.535	0.508	0.585	0.601	0.7	0.718	0.77
	50	0.292	0.524	0.497	0.576	0.341	0.542	0.512	0.604	0.621	0.725	0.758	0.852

Appendix-B

Table B.6 Calculated values of conductance

Arc voltage		77V			81V			85V		
Arc condition	Power rating (KVA)	Arc Length (m)	Arc current (A)	Conductance Per unit area	Arc Length (m)	Arc current (A)	Conductance Per unit area	Arc Length (m)	Arc current (A)	Conductance Per unit area
Normal arc	17	0.017	221	0.049	0.010	210	0.026	-	-	-
	20	0.010	260	0.034	0.006	247	0.018	-	-	-
	25	0.006	325	0.025	0.003	309	0.011	-	-	-
N ₂ plasma	17	0.025	221	0.072	0.020	210	0.052	0.016	200	0.038
	20	0.018	260	0.061	0.014	247	0.043	0.012	235	0.033
	25	0.013	325	0.055	0.009	309	0.034	0.008	294	0.028
H ₂ Plasma	17	0.026	221	0.075	0.024	210	0.062	0.023	200	0.054
	20	0.020	260	0.067	0.017	247	0.052	0.016	235	0.044
	25	0.016	325	0.067	0.013	309	0.050	0.011	294	0.038

Table B.7 Recovery of different elements in liquid melt

Sample Code	Heat No	Si	Al	Mn
P1C1G1T1	1	24.00	15.00	54.76
P1C1G1T2	1	30.00	27.00	62.00
P1C1G1T3	1	35.00	33.26	69.00
P1C1G1T5	1	42.00	29.00	64.00
P1C1G1T8	1	77.00	18.00	60.00
P2C1G1T1	2	24.00	22.13	56.08
P2C1G1T2	2	34.00	32.10	64.00
P2C1G1T3	2	40.00	37.17	69.00
P2C1G1T5	2	55.00	36.28	66.00
P2C1G1T8	2	80.00	30.10	60.20
P7C2G1T3	3	39.08	33.26	60.34
P8C2G1T3	4	42.02	37.17	61.85
P9C2G1T3	5	32.20	28.27	58.13
P10C2G1T3	6	40.80	30.12	60.04
P7C1G1T3	7	42.00	37.20	69.20
P8C1G1T3	8	43.07	39.10	69.34
P3C2G1T3	9	34.00	31.00	50.00
P4C2G1T3	10	35.00	34.00	50.22
P5C2G1T3	11	32.00	30.00	45.00
P6C2G1T3	12	32.00	32.01	47.08
P13C2G1T3	13	33.29	21.86	59.62
P14C2G1T3	14	32.21	33.30	34.39
P11C2G1T3	15	50.81	40.49	63.28
P12C2G1T3	16	48.02	40.12	60.00
P15C2G2T3	17	14.18	5.30	31.89
P16C2G2T3	18	14.99	9.06	33.21
P7C2G2T3	19	44.98	18.19	64.76
P8C2G2T3	20	49.00	19.15	70.70
P7C2G0T3	21	25.23	12.28	53.28
P8C2G0T3	22	28.11	14.95	53.43

Appendix-B

Table B.8 Energy and graphite consumption of different melting

Heat No	Energy consumption (electrical) (kWh/t charge)	Graphite electrode consumption (kg/t charge)	Average sound generation in different stages of melting (dB)				
			Furnace Start	Melt finish	Plasma start	Charging done	Reduction complete
01	2100	24	70	65	61	58	59
02	1900	18	69	64	61	58	59
03	3000	34	68	64	58	56	59
04	2500	28	69	64	57	55	60
05	2950	31	69	67	60	57	58
06	2570	29	69	67	61	55	58
07	1400	20	65	63	60	57	58
08	1300	19	65	63	60	57	58
09	3300	44	69	66	62	55	58
10	3000	32	69	67	61	55	58
11	4800	54	70	68	62	60	63
12	4400	42	69	65	61	60	62
13	4000	41	68	64	57	55	59
14	3500	35	69	64	57	56	58
15	2800	28	68	65	59	57	59
16	2400	28	68	64	58	56	60
17	5200	60	69	65	61	60	61
18	4500	54	68	64	57	55	58
19	2500	38	69	64	60	58	59
20	1960	28.5	69	63	61	57	59
21	4800	54	69	64	64	58	60
22	4000	32	69	63	64	59	60