

EXPERIENCES WITH ECOSMART MATERIALS ENGINEER'S PERSPECTIVE

Presented to EcoSmart Conference
*"Practical Experiences with
EcoSmart Concrete"*

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EcoSmart Program

- Implement existing technology in replacing a percentage of the cement with SCMs, particularly fly ash. "The replacement shall be the maximum practical consistent with constructibility requirements".
- Produce sustainable concrete.



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Current EcoSmart Focus

- Address industry concerns and misconceptions by Demo-Projects.
- Assist industry in mitigating risk with EcoSmart concrete.



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Current EcoSmart Focus

(continued)

- Review fly ash QC requirements in Standards:
 - as produced
 - as concrete in the field



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EcoSmart Concrete is User Friendly

- Improved workability
- Improved pumpability
- Improved consolidation
- Improved surface finish



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Technical Issues

- Shrinkage - lower because much lower water content.
- But you must provide curing.



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Technical Issues

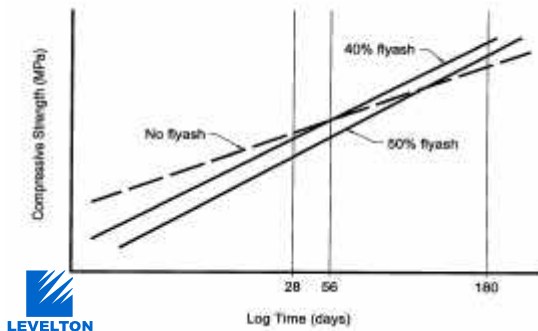
(continued)

- **Early strength:**
 - critical to formwork cycling and reshoring
 - increased problem in cold weather
 - can increase form pressures
- **Solutions:**
 - admixtures - needs work
 - activators - needs work
 - heat - needs work

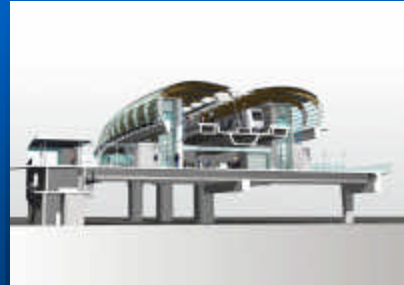


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AGE : STRENGTH OF MIXES WITH FLYASH



RTP Project

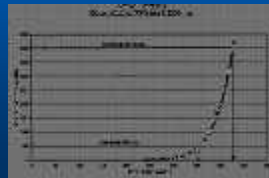


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RTP Project

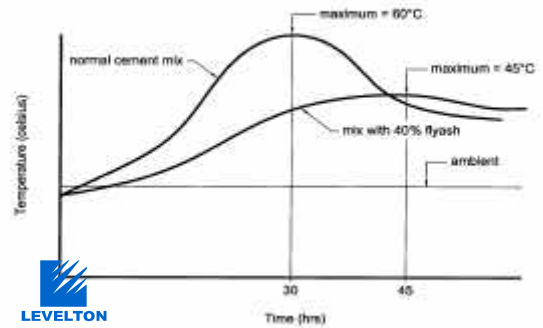


Time of Set Curve



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USE OF FLYASH TO REDUCE HEAT IN MASS CONCRETE



Technical Issues

(continued)

- **Finishing Flatwork**
 - delayed setting - more labour
 - sticky
 - limited bleed water
- Currently limit amount of fly ash replacement



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Technical Issues

(continued)

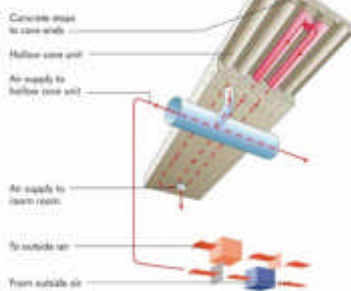
Scaling:

- Problem with extreme freeze/thaw cycles, particularly in the presence of deicing salts.
- Conflicting experience in the field but definite increased scaling in ASTM test.
- Limit fly ash to 20%.



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The ThermoDeck principle



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Technical Issues

(continued)

Economics:

- Cost of concrete as delivered \$5 @ \$8/m³ less.
- Reduced patching costs on vertical elements.



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Technical Issues

(continued)

Economics: (continued)

- May be increased formwork and shoring costs.
- Owners use “green” concrete to market project.



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Experience in Tenders

- Supply of concrete = neutral
- Cost of construction - ??



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Some Logical Uses of SCMs

- SCC
- RCC
- Flowable Fill (could also use secondary SCMs not appropriate for concrete)



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Little Mountain Reservoir

Project Parameters:

- Demolish exiting reservoir – all demolition must be recycled
- Construct new reservoirs in 2 stages
- Minimize impact on Park
- Use green concrete



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Property	Element							
	Base Slab & Footings		Columns and Walls		Roof Slab		Topping	
	Cell 1*	Cell 2	Cell 1*	Cell 2	Cell 1*	Cell 2	Plaza**	Pave-ment
Mixture Proportions								
Class of Exposure	N		C2		C2		F1	C1
Maximum Aggregate, mm	20		20		20		20	28
Minimum Mass of Coarse Aggregate, % total aggregate	60		62		60		58	-
Fly Ash, Minimum % of cementing materials	30	35	35	45	30	40	25	15
Maximum Water-Cementing Materials	0.45		0.45		0.45		0.45	0.40
Admixtures								
Superplasticizer	N		Y		N		N	
Shrinkage reducing	Y		N		N		N	
Plastic Concrete								
Slump, before // after S/P, mm	70		60 // 180		70		70	150
Air, % + 1	3		5		5		6	6
Compressive Strength, MPa								
Form Strip (in situ)	N/A		15		25		N/A	N/A
28 days							35	40
56 days	35		35		35			10/20***



Thank You



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