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Section	Page	Section	Page
1.0 General Provisions	1-1	17.0 Reinforcement Details	17-1
2.0 Materials	2-1	18.0 Reinforcement Details	18-1
3.0 Formwork	3-1	19.0 Reinforcement Details	19-1
4.0 Concrete	4-1	20.0 Reinforcement Details	20-1
5.0 Reinforcement	5-1	21.0 Reinforcement Details	21-1
6.0 Design	6-1	22.0 Reinforcement Details	22-1
7.0 Construction	7-1	23.0 Reinforcement Details	23-1
8.0 Inspection	8-1	24.0 Reinforcement Details	24-1
9.0 Testing	9-1	25.0 Reinforcement Details	25-1
10.0 Quality Control	10-1	26.0 Reinforcement Details	26-1
11.0 Safety	11-1	27.0 Reinforcement Details	27-1
12.0 Maintenance	12-1	28.0 Reinforcement Details	28-1
13.0 Rehabilitation	13-1	29.0 Reinforcement Details	29-1
14.0 Repair	14-1	30.0 Reinforcement Details	30-1
15.0 Protection	15-1	31.0 Reinforcement Details	31-1
16.0 Sealing	16-1	32.0 Reinforcement Details	32-1



Section	Page
1.0 General Provisions	1-1
2.0 Materials	2-1
3.0 Formwork	3-1
4.0 Concrete	4-1
5.0 Reinforcement	5-1
6.0 Design	6-1
7.0 Construction	7-1
8.0 Inspection	8-1
9.0 Testing	9-1
10.0 Quality Control	10-1
11.0 Safety	11-1
12.0 Maintenance	12-1
13.0 Rehabilitation	13-1
14.0 Repair	14-1
15.0 Protection	15-1
16.0 Sealing	16-1

JOURNAL TECHNICAL PAPER

Design of Reinforced Concrete

Reinforced concrete is a composite material consisting of concrete in which reinforcement bars called rebar are embedded. The concrete provides compressive strength, while the rebar provides tensile strength. This combination allows for the construction of structures that can withstand both compression and tension forces.

The design of reinforced concrete structures involves several key considerations, including material properties, load conditions, and structural behavior. Engineers use various design codes and standards to ensure the safety and durability of these structures. The design process typically involves determining the required reinforcement based on the applied loads and the geometry of the structure.



ACI 308R-90

Thermal and Volume Change Effects  
Cracking of Mass Concrete

This document provides guidelines for the design and construction of mass concrete structures to minimize cracking caused by thermal and volume changes. It covers topics such as material selection, curing practices, and the use of expansion joints. The document is intended for use by engineers and construction professionals involved in the design and construction of large concrete structures.



Specification for Hot Weather Concreting			
ACI 305.1R-19			
Approved by ACI Committee 305			
1.0	Scope	1.1	Summary of Requirements
2.0	Materials	2.1	Cement
3.0	Proportions	3.1	Design Mix
4.0	Construction Methods	4.1	Preparation of Materials
5.0	Quality Control	5.1	Testing
6.0	Performance	6.1	Workability
7.0	Special Requirements	7.1	Finishing

ACI 305r.

Full PDF PackaGownload Packagethis papers short summary of this document19 complete PDFs related to this PaperDownloadPdf Pack 1. Design mix for hot climate concrete gym / mixed by: Ahmed Elgasayer. 2. Introduction i u The design of a concrete mixture is a complex procedure. It depends on many factors, such as material properties, method of preparation, placement and healing of the concrete, as well as the requirements of a construction. Why? 4. What is the hot climate u u u Hot Weather is set in ACI 305 is any combination of the following condition that tends to harm the newly mixed or hardened concrete quality, accelerating the moisture loss rate and the cement hydration rate 5 . - high room temperature. - High concrete temperature. - low relative humidity. - High wind speed. - Solar radiation. - Loss rate of fall and corresponding 6. Potential problems in the warm climate Concrete the newly-myst state u Greater water demand. The increased rate of drop loss - higher scenario adjustment rate u higher tendency to plastic shrinkage and thermal cracks 7. The concrete in the hardened state i u u Strong forces resulting from the greatest water demand (adding 20 kg of Water could force in 12 to 15%) i u decreased the durability resulting from crack 8. i u To develop a suitable method for the design of the concrete mixture in the warm climate, the effects of the following factors were considered. 1. Water 2. Cement 3. Strike four. Admixtures 9. Water of 1-Water u, as a concrete ingredient, influences quite many of its significant properties, both in the newly-mixed and hardened state. High water temperatures cause higher concrete temperatures and as the concrete temperature increases, more water is needed to get the same fall. 10. 1-1 Concrete temperature effect water requirement 11. u u The extra water increases the w/c and will decrease the strength, durability, water tightness, and other related properties of the concrete this should be accounted for during mixture proportioning. u u u (Addition of 20 kg of water could reduce the strength by 12 to 15%) 12. 1-2 Effect on drying shrinkage u u u Drying shrinkage generally increases with total water content increased. u u u Rapid slump loss in hot weather often increases the demand for water, increasing total water content and, therefore, increasing the potential for subsequent drying shrinkage. u u u Concrete cast in hot weather is also susceptible to thermal shrinkage 13. 1-3 Effect on Temperature of concrete u u u Because water has a specific heat of about four to five times that of cement or aggregates, the temperature of the mixing water has the greatest effect per unit weight on the temperature of concrete, even though water is used in smaller quantities than the other ingredients. u u u In general, lowering the temperature of the batch water by 3.5 to 4A AF (1.9 to 2.2A AC) will reduce the concrete temperature approximately I AF (0.5A AC), but the quantity of cooled water should not exceed the batch water requirement 14. which will depend on the mixture proportions and the moisture content of aggregates. u u u Water can be cooled to as low as 33A AF (1A AC) using water chillers, ice, heat pump technology, or liquid nitrogen. 15. u u u To keep it cold. tanks, pipes, and trucks used for storing or transporting water should be insulated and painted white. u u u Using ice as part of the mixing water is a major means of reducing concrete temperature u u u When greater temperature reductions are required. Cooling by injection of liquid nitrogen into the mixer holding mixed concrete can be the most expedient means Injected liquid nitrogen does not affect the mixing water 16. What if we make the water content remain constant ? 17. u u u when the .sadazillit res mairedop amrof artuo ed euq aSafrof ed sadrep rative arap .sodaupeda arutsim ed setsuja moc .sodasu res medop sele .atercnoc aicn u u u u Atsiser a matnemua etnemilareg sarutsimda sa odnadrater e odnizuder aug i A euqroP augA gnidratr e rotudeR s sacimAug sarutsimda ed sopit 1-3 .12 .saxiab siam sarutarepmet a sadacoloc sarutsim mes otercnoc .seroirepus uo sieviArampoc saicn u u u u Atsiser e osu ed sodagnolorp sodoArep arutsim ed aug i A ed adnamed ronem ruicni medop socAfeneb sO .siatnelbma sarutarepmet satla ed sodoArep etnarud odacoloc otercnoc od sieviAjeseidi sacitsAretcarac sad samugla revloser somedop sarutsimda saleF . sacimAug sarutsimda - 3 .02 .edadillibarud e aicn u u u u Atsiser recentrof arap air iAssecen edaditnau A odatimil res eved otnemic ed roet o .otnatroP .otnemic ed roet ues oa lanoicroporp e A otercnoc ed arutsim adanimreted amu me otnemic od oEASAtardih ad arutarepmet ad otnemua O odizuder e A otercnoc od otnemairfer . ocimr e At gnikcar e ocsir o e .acimr e At oEAsnapx sonem i AH .saxiab siam ocip ed sarutarepmet me odnatluser .oternoc ed arutarepmet a iArafeta oug e rolac ed otnemivlownesed ed atnel siam axat a .sotnel siam sotnemic rasu oA . 91 odigetorp of An es .arudahcar ocits; Alp ed otnemihlocne o ribixe lev iAvorp siam e A atnel siam ofASAxif ed sotnemic so m e Atnoc euq otercno C etercnoC .etneug amilc me otercnoc od oiesunam ed sacitsAretcarac sa rarohlem edop otnemic odarutsim SI uo PI opit uo dnaltroP otnemic II atnel siam oEASArugifnoc ed opit mu ed osu O fo etneug amilc o erbos odidiced otiefe mu ret edop ralucitrap otnemic mu ed oEASAleles fo otnemic 2 .81 .etnematerroc adazillitu e A aug i A ed oEASAuder ed amag atla ed arutsimda a uo .aid e Am amag ed aug i A ed rotudeR .oEASAuder-aug i A amu odnauc ronem iAres oEASAmacsed a radum arap air iAssecen arutsim ed aug i A )mm 52( .I ed acrec rop adeuq a riunimid arap odarepse res edop arutarepmet me F A02 ed otnemua mu euq acidni .etnatsnoc aditnam e A aug i A ed arutsim ed of high concrete temperatures. Type (D) can increase early bleeding and the rate of concrete bleeding. This early bleeding induced by admistura can be useful in preventing drying of the concrete surface placed at high ambient temperature and low humidity. 22. ) Concrete flow ( super plasticizer ) In higher delumps, the internal friction heat gain during the mixture of the concrete will be smaller. The improved handling characteristics of the fluent concrete allow for more placement and consolidation, and the period between mixing and initial finishing can therefore be reduced concrete points are generally considered substantially greater than comparable concrete without mixtures and with the same cement content. 23. . Slump Extended Some water reduction admixtures can make the concrete prolong its working time up to 2 hours, followed by the acceleration of the gain of strength. s Average range water that reduces admisturas. s The concrete set containing a mixture should be evaluated for the consistency of performance in relation to the desired characteristics in the construction of warm weather. as the working capacity, permeability, early strength development, Placing and finishing features. Besides the basic properties of fainting retention, adjustment time, and force. These characteristics can influence the selection of an admistura and its dosage more than the properties usually covered by most specifications. 25. 4-Aggregate aggregate usually count to 60 to 80% of the normal weight concrete volume. Therefore, aggregate properties affect concrete quality significantly. For example Crushed coarse aggregate contributes to higher water demand than rounded gravels, but is reported to provide better crack resistance. The gross aggregate is the ingredient with the largest mass of concrete: the changes in its oEASAregrifeR oEASAregrifeR .oternoc ed sarutarepmet sa erbos lev iAredisnoc otiefe mu m u A u At Aggregate can be an effective complementary medium to reach the desired lower boutum temperature 26. proportions. Mixture proportions must be established or adjusted based on field performance records indicating the effect of expected seasonal temperatures and delivery times. The selection of ingredients and their proportions must be guided by their contribution to the satisfaction of the concrete under clummon conditions hot to the cement content must be kept as low as possible, but sufficient to meet the resistant and durability requirements 27 . . Inclusion of complementary cement materials, such as fly ash or scanning cement. It should be considered to slow the configuration and reduce the increase in hydration heat temperature. The use of vain types of water reducing adheisures may compensate for increased water demand and loss of force that could be caused by higher concrete temperatures. 28 . High -range retarders of water reduction formulated for prolonged peel retention should be considered where longest delivery times are anticipated. . Betha should be provided for a fall of no less than 3 in. (75 mm) To allow the placing rude and effective consolidation in form. The test lots are so made. 29. Concrete temperature control. Concrete can be produced in hot climate without max limits to put the temperature. But a effort must be made to maintain the temperature of the concrete fresh as low as possible. S Bethlet can typically be reduced by 1 a u F (0.5c) If either of the following reductions are made at material temperatures: 1. (4a u C) reduction of cement temperature; 2. Reduction of water temperature (2a u C) 3. reduction of 2 u F at the temperature of the aggregates. 30 . . Like most concrete is aggregate, the reduction of the aggregate temperature brings the highest reduction in the temperature of eicAfrepus eicAfrepus ed otnemanzama ed seuqnaT . The water mixture should be supplied with shade and thermal insulation. i u Mixer cooling drum. Water chillers or heat pump technology as well as other methods. how to replace crushed or flaccid ice by mixing or cooling water by liquid nitrogen. 31. Curing in warm climate u u u For mass concrete, the cure should be by water for the basic period of healing, when the air temperature is higher than 20 u C or more than 20 u C, in order to minimize the increase of the concrete temperature. If approved, the application of the healing compound should be preceded by 24 hours of wet cure. 32. Precautions. Use materials and mixing proportions that have a good record in warm weather conditions. Cool the concrete or one or more of its ingredients. Use the use of the mixtures and the carefully design of the concrete mixture. Use a concrete consistency that allows quick placement. Reduce transportation, placement and finishing time possible. 33. u u u Agenda concrete placements to avoid extreme weather, such as at night or during favorable weather conditions. Consider the methods to limit moisture loss during placement and finishing, such as sun dumplings, wind screens, fog and spray. 34. References 1. Reported by the ACI 305 Committee. Guide to Concreting Wood Weather. 2. Concrete mixing design for hot weather report by: al-Gahtany, Husain Jubran. Jubran.

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