MINIMUM REINFORCEMENT REQUIREMENTS FOR REINFORCED HIGH-STRENGTH CONCRETE SLABS pdf

1: Minimum reinf. for slab-on-grade - ACI (concrete) Code Issues - Eng-Tips

The minimum amount of steel reinforcement is defined as that for which "peak load at first concrete cracking" and "ultimate load after steel yielding" are www.enganchecubano.com this way, any brittle behavior is avoided as well as any localized failure, if the member is not over-reinforced.

Minimum Reinforcing in Concrete Tanks. Reinf for Slabs 14 Sep 08 This requirement is normally applied where there is no significant flexural action and if in cases where the slab would not fail if this reinforcement were to fail, in other words if a load path still exists without this reinforcement,. ACI does suggest that this requirement also applies in raft slabs but I cannot understand why as there is significant flexural stress. The reason given in the commentary is that the cracked strength must be greater than the uncracked strength, and there is good reason for this as it explains. The other forgotten reason is that we never check the strain level in reinforcement at ultimate strength. So, where there is significant flexure and the load path for the slab requires strength at a cross-section, minimum reinforcement is required at an section where there is tension at a concrete face. This does not necessarily require reinforcement at both faces everywhere as someone suggested, only at locations where there is flexural tension. So, in conclusion, if you are relying on reinforcement to provide flexural strength and to support the structure, the minimum is required on any face that requires tension reinforcement. What reference is that out of? The more I read, the more I scratch my head. No wonder my hair is getting so thin up there: I need to examine this thread and the previous two threads again to try to figure this out. Reinf for Slabs 15 Sep 08 Some of us, more than once. I think it helps to limit the discussion to one code or the other vs , as they may and seem to say different things. Early on, I tried to apply reasoning to and quickly got confused. For ACI, flexural minimum per I noticed that none of the committee members that developed ACI were involved in ACI at least not on the last revisions. The only reason I keep comparing the two is because at the ACI seminar I attended, the instructors said that ACI was intentionally re-written to parallel so I would assume that the provisions are based on similar rationales and theories maybe not a wise assumption?!? So my apologies if I am repeating anything and for the long-windedness I must admit, based on the definition of As,min in Chapter 2 that My interpretation is that if a member is subject to flexure, whether it is a slab, beam, wall, or footing, regardless of what the load is from, or what direction, that This is answered in the Commentary R Otherwise, what is the intent of that Section? Regarding the concerns about "sudden, brittle failure" At that stress the reinforcement yields suddenly and stretches a large amount Failure in such a case can be sudden. To prevent such a failure , a minimum amount of tensile reinforcement is required by Was it solely the PCA Notes you referenced that convinced you? JAE Thank you for you comments, I have great respect for your wisdom. Did you ever feel that the longer we stay in this profession, the less we seem to know? Concrete sections that are at least 24 inches may have the minimum shrinkage and temperature reinforcement based on a 12" concrete layer at each face. The reinforcement in the bottom of base slabs in contact with soil may be reduced to 50 percent of that required in table 7. For walls, the minimum area of reinforcement steel shall be as required by I wonder what the intent was in revising that wording. The instructor at the ACI seminar I attended indicated that is generally being revised subsequent to revisions, so I suspect this may change with the next version of So reading this I would say, based on ACI In addition, I believe So I guess the first interpretation we must make: For "structural slabs and footings", do we skip Or do we satisfy all of the requirements of Section Second, we must interpret how the distribution of reinforcement per 7. Anyone have an aspirin? I have analyzed an example slab using and requirements that I would like to share. For those not familiar with , additional consideration of an "environmental durability factor Sd " must be included in determining the required strength for liquid-tight structures. For the same loading and slab I get: In this case, this requirement ends up reducing my 5 spacing to 9" 0. And this is understandable, and is explained in the commentary as a control to keep the structure liquid-tight and to prevent "sudden" failure.

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2: Shrinkage and Temperature Reinforcement | Engineersdaily | Free engineering database

Minimum concrete compressive strength at time of specified for reinforced concrete. PLAIN REINFORCEMENT. High-strength steel element such.

OP 26 Apr 06 I have a pre-engineered building with a typical turndown slab over isolated footings foundation. Building shears are transfered to the slab with hairpin bars. Its my opinion the use of hairpin bars in this manner requires the slab be considered a structural element and subject to the minimum area of steel required by the code for structural concrete. ACI does not address slabs on grade used in this manner. Does anyone have any information on this subject? For larger frames with larger thrust reactions, we prefer continuous ties between the piers below the slab in a concrete duct. If you are concerned whether the slab should be reinforced as a structural element with the hairpin approach, I suggest using the continuous tie. Sadly, design is not an issue here. The building collapsed durring construction and I have been hired by the owner to find fault. This project will likely end up a court room. Thats why I was wondering if anyone knows of a code requirement. Since I posted this thread, I found that The commentary on this section specifically mentions preengineered buildings with hiarpin configurations. Does this requirement mean that slabs should be designed as oneway slabs, twoway slabs, or something else? When the lateral load from the column causes the pedestal deflect outward, thus introduces tension in the hair-pin, the mass of slab-on-grade then provides resistance force through gravity and friction. This mechanism is a localized phenomenon, the slab-on-grade needs not to be reinforced entirely as a structural element for this purpose, provides that the hair pin legs are adequate to resist the tensile force, it has adequate development length per code , and the concrete covers per code are adequate to avoid pull-out failure. However, for practical reasons, additional reinforcing may be provided accross the joint to reduce stress in the bars to minimize cracks on the slab near the joint. Red Flag This Post Please let us know here why this post is inappropriate. Reasons such as off-topic, duplicates, flames, illegal, vulgar, or students posting their homework. Cancel Thank you for helping keep Eng-Tips Forums free from inappropriate posts. The Eng-Tips staff will check this out and take appropriate action.

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3: ACI Reinforced concrete beam design parameters - RCSolver

High-Strength Reinforcing and Concrete margins and minimum ductility requirements of component materials. made with High Strength Reinforcement with minimum.

The ACI Commentary states that the amounts of shrinkage and temperature reinforcement specified for deformed bars and welded-wire fabric are empirical, but have been used satisfactorily for many years. Prestressed tendons can be used to provide shrinkage and temperature reinforcement, but this discussion refers only to the nonprestressed reinforcement requirements of ACI The checklist below can be used to ensure that the requirements of Section 7. Checklist for Shrinkage and Temperature Reinforcement To satisfy the shrinkage and temperature reinforcement requirements of ACI Use the requirements for one-way slabs only; Place the shrinkage and temperature reinforcement normal at right angles to the flexural reinforcement; Provide the minimum ratios of reinforcement area to gross concrete area; 0. Both positions are effective in controlling cracks. Some engineers place the shrinkage and temperature reinforcement over the flexural reinforcement bottom bars in a positive-moment region and below the flexural reinforcement top bars in the negative moment region. Can fiber reinforcement be used instead of deformed bars to resist shrinkage and temperature stresses? If so, what fiber dosage is needed? When shrinkage and temperature movements are significantly restrained, how does the designer determine the amount of reinforcement needed? Can Fibers be Used? The code requirements for prestressing tendons used for shrinkage and temperature reinforcement might provide a starting place. The equivalent yield-strength force of the Grade 60 steel would be 0. The prestressing reinforcement requirement would provide an effective force of psi x 6 in. Designers wishing to substitute fibers for deformed bars or welded-wire fabric could possibly show calculations or test results to demonstrate that this effective force is achievable with the proposed fiber type and dosage. If steel fibers were approved for use instead of steel bars or welded-wire fabric, design professionals might still prefer to use bars for crack-width control at reentrant corners in slab openings or at locations where slab thickness has changed. Accounting for Significant Restraint When flexural members are restrained at the supports, drying shrinkage or thermal contraction causes a buildup of tensile forces that are additive to any bending forces caused by external loads. But in one-way slabs, crack width is controlled only by the shrinkage and temperature reinforcement perpendicular to flexural reinforcement. Because of this problem, ACI requires that the effects of forces due to shrinkage and temperature changes be taken into account where structural walls or large columns provide significant restraint to structural slab movements. In this one-way slab, restraint of movement by the stair towers might require the area of shrinkage and temperature reinforcement to be twice as great as the minimum area required by Section 7. Without the extra reinforcement, width of cracks perpendicular to the flexural steel could be excessive. Estimating Forces Section 8. It offers no guidance for determining the most probable values. The analysis requires assumptions about: The amount of drying shrinkage that will occur in reinforced concrete, and, if a shrinkage gradient is assumed, the shrinkage differences between the top and bottom of the slab; The amount of thermal contraction and, if a temperature gradient is assumed, temperature differences between the top and bottom of the slab; and The time-dependent modulus of elasticity and tensile strength of the concrete. A shrinkage and temperature analysis using an elastic model will typically result in large, calculated internal forces that are probably closer to upper-bound values than to most probable values. An inelastic analysis, using an age-adjusted modulus of elasticity, will help account for the time-dependent behavior of the structure and result in lower internal forces. Gilbert 2 indicates that the shrinkage and temperature reinforcement required for a fully restrained slab could be double that required by ACI He shows that the Australian code requires two to three times more shrinkage and temperature reinforcement than the minimum required by ACI The figure shows an example of a one-way slab spanning between beams, with walls for stair towers that would cause significant restraint. In the bays not restrained by the stair towers, the minimum shrinkage and temperature reinforcement required by ACI would be adequate. Shrinkage Control

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Strips The commentary for Section 7. A shrinkage control strip, often called a closure strip or pour strip, is a temporary separation used during construction to permit initial shortening to occur in two or more separate slab regions. In post-tensioned slabs, the shortening can be a combination of drying shrinkage, thermal contraction, and creep and elastic deformation resulting from the post-tensioning. The control strip is left open to allow each slab region to shorten, and is then closed by filling it with concrete. Closure strips are sometimes an alternative to expansion joints when a building length exceeds ft 76 m. Some closure-strip details are as follows: Open time before infilling: Recommendations vary from 2 to 12 weeks, but the time chosen should preferably be based on calculations. For post-tensioned slabs this width, 30 to 36 in. For nonprestressed structures, the width is usually about 36 to 48 in. Typically at the quarter span where moments are small; however, they may be located at other regions to reduce the restraint provided by walls or large columns. In short spans, they may be located at midspan. Extends from the concrete slab on each side into the closure strip to form a lapped splice. Closure strips left open for long time periods can be expensive. On some of our projects, we were required to keep the strips open for 90 days. When building a multistory structure at a rate of a floor a week, concrete contractors can be 12 floors above the first open closure strip. Designers often require the bay enclosing the closure strip to be formed and shored during the waiting period. This ties up forms and shores for a longer time and results in more expensive construction. Delaying the other trades can extend the schedule required to complete the building. Because delaying filling the closure strip can be expensive, designers need to carefully determine the time requirement. From experience, a 0. A closure strip divides a ft 61 m slab into two ft The slabs shorten from each end, resulting in a net shortening distance of 50 ft 15 m. The ultimate reinforced-concrete shortening is estimated to be 0. Thus, when the ultimate shortening is reached, the closure-strip edges should be 0. The remaining long-term displacement would be 0. Based on the 0. For post-tensioned and nonpost-tensioned structures with closure-strip open-times greater than 30 days, our company works with the designer to agree on an acceptable displacement that must occur before the strip is filled. A testing-lab technician then periodically uses a mechanical gage to measure the distance between gage plugs glued to the slab surface on each side of the closure-strip opening. When the measured displacement is reachedâ€”0. Typically, the time required to reach the 0. Occasionally, the required displacement can be reached earlier because some designers specify a maximum permissible shrinkage for the concrete, and this minimizes the time required to get to the 0. The first few floors above a rigid plaza level are usually critical due to the stiff restraint provided at that level. As the building rises higher, however, the floor movement is restrained less and the floor below is shortening while the floor above is placed. This reduces the amount of waiting time needed to reach the 0. The roof slab closure strip can typically be closed in about half the time needed for the floors below. When measuring the distance across a closure strip, the technician must also record the temperature of the structure because displacements caused by temperature changes have to be accounted for. For example, when the temperature increases, the distance across the closure strip may decrease rather than increase because of thermal expansion. To correct for displacement caused by thermal movements, subtract the temperature when the slabs were poured from the temperature recorded during measurement of the distance across the closure strip. Multiply the temperature difference by the coefficient of thermal expansion for the concrete and by the half-length of each building section to estimate the thermal movement. Correct the measured distance across the closure strip by the temperature-change distance to find out how much shortening is occurring, and at what rate. What if the timing is wrong? Waiting to fill the closure strip can be costly because it affects other trades and delays building completion. But filling the closure strip too early can create cracks. However, if the ceiling is painted or sprayed, or the floor requires crack repair before covering, this may be an added expense. The owner might prefer to accept a few cracks and pay for crack repair instead of delaying building completion by more than a month.

4: Concrete Slab Mesh-Welded Foundation and Road Reinforcement

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Using rigid-plastic methods, a sufficient condition is derived for steel in a certain arrangement, in a given concrete slab without membrane forces, to be the least possible volume of reinforcement necessary to carry given loads normal to the slab plane, when energy dissipation in the concrete at failure can be neglected.

5: Min Flex. Reinf for Slabs - ACI (concrete) Code Issues - Eng-Tips

Cover thicknesses for reinforced concrete floor slabs and beams are given in IBC Tables (1) and (3) respectively. The minimum cover requirements in Section of ACI will provide at least a.

6: Minimum Steel Reinforcement in Concrete and Clear Cover Requirements

result is a lightly reinforced slab designed to offset the effects of temperature and shrinkage of the concrete. ACI , "Design of Slabs-on-Grade", refers to this as a Type B slab.

7: Torsion of High-Strength Reinforced Concrete Beams and Minimum Reinforcement Requirement

B Typical Reinforced Concrete Slab Superstructure C Shrinkage and Temperature Reinforcement for Slab Superstructure D Integral Cap at Slab Superstructure (Typical Half-Section).

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Count not the dead Data Book of Child and Adolescent Injury V. 17. Hosea, Joel, Amos, Obadiah. Collecting in sixteenth and seventeenth century Venice : originals, copies, and / Calculus multivariable student solutions manual 10th edition Ministry of utmost happiness Details for pre engineered buildings The army of the United States, by W. Merritt. Reel 51. Breau-Brewyer London England temple Science education in japan Essays on Definition (Terminology and Lexicography Research and Practice) Simple tenses of verbs worksheets APPENDIX 2: PRACTICING THE INNER SMILE MEDITATION 134 The structure of mediation 1984 chevy camaro service manual 4.1 Architecture Overview. The pharmacopoeia of the Royal College of Physicians of London, MDCCCIX Macromedia Director 7 Dare To Repair Your Car Mr William Shakespeares comedies, histories, tragedies, poems Apartments preserving mappings 4.9.1. Contes Populaires Cadiens Cajun Folktales Some of a polarity Helen Morris Cartwright Stable and unstable equilibrium in economics Survival of the craft ideal Gullian Naylor Todays priorities in mental health Voyages Music Tape A British rifle man Rice seedlings for a family : Cambodia Day in the life of Hollywood 21st Century Patent System Improvement Act; Patent and Trademark Office Surcharge Extension Act of 1997; How to make baskets Kinship Foster Care Doddridge Co WV Marriages 1845-1900 American Bar Association. For Sociology Renewal and Critique in Sociology Toda Learning from Palladio Cambridge ielts 1 Mongol empire its legacy