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Code for design of strengthening masonry structures

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Table of Contents

1 General

1.0.1 This specification is formulated in order to make the reinforcement of masonry structures reliable in technology, safe and applicable, economical and reasonable, and ensure quality.

1.0.2 This code is applicable to the reinforcement design of masonry structures of houses and general structures.

1.0.3 Before the masonry structure is strengthened, the reliability appraisal shall be carried out according to the relevant provisions of the current national standards "Industrial Building Reliability Appraisal Standard" GB 50144 and "Civil Building Reliability Appraisal Standard" GB 50292 according to different building types. When it is carried out in combination with seismic reinforcement, the seismic capacity appraisal should be carried out according to the relevant provisions of the current national standard "Building Seismic Appraisal Standard" GB 50023.

1.0.4 The reinforcement design of masonry structures shall not only comply with the provisions of this code, but also comply with the relevant current national standards.

2.1.1 Strengthening of masonry structures

Measures such as reinforcement, partial replacement, or adjustment of internal force shall be taken for masonry structures, components and related parts that are not reliable enough or required to be improved by the owner, so that they have the safety, durability and

applicability required by the current design specifications and the owner's requirements. sex.

2.1.2 Existing structure member

The original components before reinforcement.

2.1.3 important structure member

A component whose failure by itself will affect or endanger the safe operation of the load-bearing structural system.

2.1.4 general structure member

Components other than important components.

2.1.5 composite cement mortar

Mortar with cement and high-performance mineral admixture as the main component, and mixed with admixtures and short fine fibers.

2.1.6 polymer modified cement mortar

High-strength cement mortar mixed with modified epoxy emulsion or other modified copolymer emulsion. Polymer-modified cement mortars for load-bearing structures should significantly improve their ability to anchor steel bars and bond substrates such as concrete and masonry.

2.1.7 Steel reinforcement mesh

It is a mesh welded by ordinary hot-rolled ribbed steel bars or cold-rolled ribbed steel bars.

2.1.8 fiber reinforced polymer

High-strength continuous fibers are arranged according to certain rules, and are impregnated with adhesives, bonded and cured to form composite materials with fiber-reinforced effects, commonly known as fiber composites.

2.1.9 Strength utilization factor of material

Consider the calculation coefficient introduced by the fact that the strength of the reinforcement material cannot be fully utilized under the condition of secondary stress.

2.1.10 external layer strengthening

A reinforcement method that increases the bearing capacity and stiffness of the original

component by adding a reinforced concrete surface layer or a reinforced mesh mortar surface layer.

2.1.11 Outsourcing steel reinforcement method sectional steel strengthening

The reinforcement method in which the masonry columns are welded with shaped steel limbs and panels, and the external forces are distributed according to the respective stiffness ratios, is also called dry-type outsourcing steel reinforcement method.

2.1.12 external prestressed strut strengthening method

By tightening the transverse screw device, preloading is applied to two pairs of angle steel braces with cutouts and bent shapes, so as to release the load borne by the masonry column to the braces.

2.1.13 buttress column reinforcement method counterfort masonry column strengthening

The reinforcement method of thickening the local wall at intervals along the length of the masonry wall to form a wall with stacked stiffeners.

2.1.14 masonry crack repairing method masonry crack repairing

A repair or repair performed to seal cracks in masonry or to restore the integrity of cracked masonry.

2.2.1 Material properties

Em-Elastic modulus of original component masonry;

Ea-the elastic modulus of newly added steel;

Ef-elastic modulus of newly added fiber composite;

fmo, f-respectively design values of compressive strength of original masonry and new masonry;

fc-design value of axial compressive strength of newly added concrete;

fy, f'y-respectively design values of tensile strength and compressive strength of newly added reinforcement;

ff-new design value of tensile strength of fiber composite material.

2.2.2 Action effect and bearing capacity

N-design value of axial pressure after member reinforcement;

M-Design value of bending moment after component strengthening;

V-Design value of shear force after strengthening of member;

sigmas-tensile stress of steel bar.

2.2.3 Geometric parameters

Amo-the cross-sectional area of the original member masonry;

Ac - newly added concrete cross-sectional area;

As-the cross-sectional area of newly added reinforcement;

Aa-the total cross-sectional area of newly added section steel (angle steel);

h-the section height of the member after reinforcement;

ho-the effective height of the section after reinforcement;

b-the rectangular section width of the original member;

Imo-the section moment of inertia of the original member;

Ia-steel frame section moment of inertia;

Ho-calculated height of member;

hT-converted thickness of wall section with pilasters.

2.2.4 Calculation coefficients

beta-height-thickness ratio of masonry components;

alphac-additional concrete strength utilization factor;

alphas-additional reinforcement strength utilization factor;

alphaf-fiber composite material participation work coefficient;

alpham-additional masonry strength utilization factor;

-Stability factor of composite masonry members under axial compression;

Km-the original masonry stiffness reduction coefficient;

eta-cooperative work coefficient;

rhof-circumferential enclosure volume ratio.

3.1 General provisions

3.1.1 When the masonry structure needs to be reinforced after the reliability appraisal, the reinforcement design shall be carried out by qualified professional and technical personnel