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Standard for design of strengthening steel structure

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1 General

1.0.1 This standard is formulated in order to make the reinforcement design of steel structures to be technically reliable, safe and applicable, economical and reasonable, and to ensure quality.

1.0.2 This standard applies to the design of steel structure reinforcement for industrial and civil buildings and general structures.

1.0.3 Before the steel structure is strengthened, according to the types of buildings (structures), inspection or appraisal shall be carried out according to the current national standards "Industrial Building Reliability Appraisal Standard" GB 50144 and "Civil Building Reliability Appraisal Standard" GB 50292 respectively. When it is combined with seismic reinforcement, the seismic capacity appraisal should be carried out according to the current national standards "Code for Seismic Design of Buildings" GB 50011 or "Standards for Seismic Appraisal of Structures" GB 50117.

1.0.4 The design of steel structure reinforcement shall not only comply with this standard, but also comply with the current relevant national standards.

2.1.1 Strengthening of steel structure

Take measures such as reinforcement, partial replacement or adjustment of internal force for steel structures, components and related parts that are not reliable enough or require improved reliability by the property owner, so as to make them meet the current design standards and the safety, applicability and safety required by the property owner. durability.

2.1.2 Existing structure

The original structure before reinforcement is also called the structure before reinforcement.

2.1.3 Existing member of the original component

The original component before reinforcement is also called the component before reinforcement.

2.1.4 Strengthening of unloading structure

Complete unloading of the structure in situ, or reinforcement after dismantling the components.

2.1.5 Strengthening of loading structure

In situ reinforcement of a structure after the live load has been removed or partially removed.

2.1.6 nominal stress nominal stress

The cross-sectional stress of the member calculated according to the standard or by the general method of material mechanics.

2.1.7 net section net section

Section after deduction of voids, corrosion and damage weakening failure.

2.1.8 Expandable crack expandable crack

A crack that is likely to increase in length or depth.

2.1.9 Brittle fracture oriented crack brittle fracture oriented crack

There are cracks that may cause sudden brittle fracture of steel structures and components.

2.1.10 Friction-type high strength bolt connection friction-type high strength bolt connection

Only high-strength bolted connections where forces between the plates are transferred by friction between the plates are considered.

2.1.11 Structural adhesive

Adhesives used for the bonding of load-bearing structures or components, which can withstand design stress and environmental effects for a long time, are referred to as structural adhesives.

2.2.1 Action effect

M - bending moment;

M0--the bending moment of the member before strengthening;

N - axial force;

N0--the axial force of the member before strengthening;

V - shear force;

V0--the shear force of the member before strengthening;

sigma--the maximum stress of the member under all service loads;

sigma1--Maximum stress of member under service load after deduction of initial load;

sigma0--the maximum stress of the member under the action of the initial load that cannot be unloaded;

sigmaf-perpendicular to the length direction of the fillet weld, the normal stress of the weld calculated according to the effective section of the fillet weld;

tau--shear stress;

tauf - along the length direction of the fillet weld, the shear stress of the weld calculated according to the effective section of the fillet weld.

2.2.2 Calculation indicators

E - elastic modulus of steel;

f-design value of tensile, compressive and flexural strength of steel;

f*--Design value of tensile, compressive and flexural converted strength of steel;

fwf-design value of tensile, compressive and shear strength of fillet weld;

f0-design value of tensile, compressive and flexural strength of original structural steel;

fs-design value of tensile, compressive and flexural strength of reinforcement steel;

fv-design value of steel shear strength;

fy--Standard value of steel yield strength or yield point;

G - shear modulus of steel;

NE - Euler's critical force.

2.2.3 Geometric parameters

A - Gross cross-sectional area or total cross-sectional area;

An - net sectional area;

A0 - the gross cross-sectional area of the original component;

An0 - the net cross-sectional area of the original member;

As-the cross-sectional area of the reinforced part of the member;

At - the total cross-sectional area of the member after strengthening, that is, the sum of A0 and As;

a - spacing;

d - diameter;

e0--equivalent eccentricity;

he-effective thickness of fillet weld;

hf - fillet weld leg size;

I--gross section moment of inertia;

I0--gross section moment of inertia of the original member;

Is--section moment of inertia of the reinforced part of the member;

L - length;

L0-calculated length of member;

Ls--the total length of the continuation of the welding seam of the reinforcement;

Lw--weld length;

Lws--the length of the actual welding section of the reinforcement weld;

W--gross cross-sectional resistance moment;

Wn--net section resistance moment;

W0n - the net section resistance moment of the original member;

t - the thickness of the plate;

lambda - slenderness ratio;

lambda0-the relative slenderness ratio of the member;

omega-deflection;

omega0--initial deflection;

omegaT-total deflection;

omegaw-welding residual deflection;

delta omega-deflection increment.

2.2.4 Calculation coefficient and others

t'--calculation coefficient considering the influence of sampling quantity;