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Technical code for concrete filled steel tubular structures

钢管混凝土结构技术规范

(English Translation)

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1 General

1.0.1

This code is formulated for the purpose of implementing the national technical and economic policies in the design of steel pipe concrete structures, component fabrication and engineering construction, so as to achieve safety, applicability and economy.

1.0.2

This code is applicable to the design, component fabrication and construction of industrial and civil buildings and general structures using concrete-filled steel tube structures.

1.0.3

The design, member fabrication and construction of the steel tube concrete structure shall not only comply with this specification, but also comply with the current relevant national standards.

2.1.1 Concrete filled steel tubular members

Components filled with concrete in steel pipes, including solid and hollow concrete-filled steel tube components, can have circular, rectangular and polygonal cross-sections, referred to as CFST components.

2.1.2 Concrete filled steel tubular structures

The structure using concrete-filled steel tube members as the main force-bearing members is called CFST structure for short.

2.1.3 Solid concrete filled steel tubular members

Concrete-filled components in steel pipes, referred to as S-CFST components.

2.1.4 Hollow concrete filled steel tubular members

A certain amount of concrete is poured into the hollow steel pipe, and the hollow concrete-filled steel pipe member is made by centrifugal method, referred to as H-CFST member.

2.1.5 Steel ratio

The ratio of the steel tube area to the concrete area in the member section.

2.1.6 Hollow ratio

The ratio of the area of the hollow part in the section of the hollow concrete-filled steel tubular member to the total area of the concrete plus the hollow part.

2.1.7 Hoop coefficient confinement coefficient

The ratio of the product of the steel pipe area and the design value of steel strength to the product of the concrete area and the design value of concrete strength in the member section.

2.1.8 Sea sand concrete filled steel tubular members

Concrete-filled steel tube members made of sea-sand concrete.

2.1.9 Recycled concrete filled steel tubular members

Concrete-filled steel tube members made of recycled aggregate concrete.

2.2.1 Action, effect and resistance

N--Design value of axial pressure;

N_t--design value of axial tension;

N_{tb}, N_{cb}, N_{vb}--Design value of tensile, compressive and shear bearing capacity of an ordinary bolt or high-strength bolt;

N_u, N_t, M_u, T_u, V_u--Design values of axial compression, axial tension, bending, torsion, and shear bearing capacity of CFST members;

N_l--Design value of local axial pressure;

N_{ul}--design value of local compressive bearing capacity of CFST column;

M--design value of bending moment;

T - torque design value;

V--Design value of shear force.

2.2.2 Material properties and resistance

Bsc, Bscm-combined axial compressive elastic stiffness and combined flexural elastic stiffness of CFST member section;

BG, BT-combined shear stiffness and combined torsional stiffness of CFST members;

Es, Ec - elastic modulus of steel and concrete;

Est - tangent modulus of steel;

Esc, Escm-combined elastic modulus and combined flexural modulus of CFST members;

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

fck, fc-standard value and design value of compressive strength of concrete;

ft - design value of axial tensile strength of concrete;

fce--Design value of the strength of the steel end face under pressure (planing and top tightening);

fsc-design value of compressive strength of steel tube concrete;

fsv-design value of shear strength of steel tube concrete;

ftw, fcw, fvw-design values of tensile strength, compressive strength and shear strength of butt welds;

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

ftb, fvb, fcb-design values of tensile, shear and compressive strength of bolts;

Gss - combined shear modulus of solid steel tube concrete member;

Gs-shear modulus of steel.

2.2.3 Geometric parameters

Asc-the combined cross-sectional area of solid or hollow concrete-filled steel tube members, that is, the sum of the steel tube area and the concrete area inside the tube;

As, Ac, Ah-area of steel pipe, concrete inside pipe and hollow part inside pipe;

Al--local compression area;

Ab--calculated bottom area of concrete under local compression;

D - the diameter of the circular section;

e - the eccentricity of the applied load;

I_{sc} , I_s , I_c --section moments of inertia of CFST members, steel pipes, and concrete in pipes;

i_{sc} --radius of gyration of composite section of CFST member;

L_0 --calculated length of compression member;

L_e --the equivalent calculation length of the column or the equivalent calculation length of the arch rib;

r_0 --the section radius of the circular steel tube concrete member;

r_{co} , r_{ci} --the outer radius and inner radius of the concrete in the pipe;

t - the thickness of the steel pipe;

W_{sc} , W_s , W_c --the section modulus of composite section of CFST member, steel pipe and concrete inside the pipe;

λ_{dasc} --Composite slenderness ratio of CFST member, which is equal to the ratio of the calculated length of the member to the radius of gyration of the composite section;

λ_{dasc} --the canonical slenderness ratio of CFST members;

λ_{dax} --the slenderness ratio of CFST members around the x-axis;

λ_{day} --the slenderness ratio of the CFST member around the y-axis;

λ_{daox} --converted slenderness ratio of lattice CFST members around the x-axis;

λ_{daoy} --converted slenderness ratio of lattice CFST members around the y-axis;

λ_{dal} --the slenderness ratio of a single leg of a lattice CFST member.

2.2.4 Calculation coefficients

α_{sc} --steel content of CFST members;

θ - hoop coefficient of CFST member;

ψ --hollow rate, that is, the ratio of the area of the hollow part to the sum of the area of the concrete plus the area of the hollow part;

ϕ --Stability coefficient of axial compression member;

ϕ_l --bearing capacity reduction factor considering the influence of slenderness ratio;

ϕ_{ie} --reduction factor of bearing capacity considering the influence of eccentricity;

γ_{RE} --seismic adjustment coefficient;

γ_0 --structural importance coefficient.