Internationell svetskonstruktör, IWSD - Kursprogram

Module 4: DESIGN OF WELDED JOINTS
Modul 4: Utformning av svetsförband

4.1 Categories of welded joints/Olika kategorier av svetsförband, 4tim

Objective:

The students will understand the differences between functional weld categories and how the design requirements will depend on the categories

Scope:

Weld categories:

- primary load carrying joints;
- connecting joints;
- binding joints;
- accessory joints.

Expected result at comprehensive level:

Identify various classes of welded joints based on their function.
Explain the load-bearing requirement of various weld categories.
Explain the need to avoid the under- and over-size of the throat thickness.
Illustrate the role of joint preparation and weld penetration for load-carrying joints.
Identify joint categories from an engineering structure.

4.2 Design of welded joints with predominantly static loading/Utformning av svetsförband utsatta för statiska belastningar, 8 tim

Objective:

The students will understand how the throat thickness of weld will be defined in predominantly static loaded joints.

Scope:

Throat thickness
Elastic and plastic design
Deformation capacity
Stress components in a fillet weld
Correlation factor for weld strength
Design strength
As appropriate, a suitable design guidance document, e.g., EN 1993 Eurocode 3-part 1-8: Design of Steel Structures: Design of Joints, may be used.

Expected result at comprehensive level:

Explain the assumptions involved in the design of predominantly static loaded joints.
Identify relevant stress values from a type stress-time history for a structural component.
Calculate the design strength of end welds based on weld stress components.
Calculate the design strength of side welds based on weld stress components.
Calculate the strength reduction factor for long side welds or transverse stiffeners.
Calculate the needed throat thickness for a full strength primary load carrying weld.
Calculate the throat thickness for a binding welded joint.

4.3 Design of welded joints with predominantly fatigue loading/Utformning av svetsförband utsatta för utmattningsbelastningar, 10 tim

Objective:

The students will understand how the fatigue behaviour of welded joints and be able to perform relevant fatigue life calculations.

Scope:

Fatigue of welded joints:

- stress concentrations
- residual stresses
- initial defects

Constant and variable amplitude loading
Cumulative damage
FAT class

Overview of fatigue calculation methods in a relevant design guidance document, e.g., IIW Doc. XIII-1965-03/XV-1127-03 "Recommendations for fatigue design of welded joints and components"

Expected result at comprehensive level:

Explain the assumptions involved in the design of predominantly static loaded joints.
Identify relevant stress values from a type stress-time history for a structural component.
Calculate the design strength of end welds based on weld stress components.
Calculate the design strength of side welds based on weld stress components.
Calculate the strength reduction factor for long side welds or transverse stiffeners.
Calculate the needed throat thickness for a full strength primary load carrying weld.
Calculate the throat thickness for a binding welded joint.

4.4 Design against brittle fracture/Utformning av svetsförband utsatta för risk för sprödbrott, 3 tim

Objective:

The students will be acquainted with the brittle fracture analysis based on linear elastic fracture mechanics.

Scope:

Fracture toughness
Critical stress intensity
Critical crack size
Temperature and material toughness
Overview of calculation methods in a relevant design guidance document, e.g., EN 1993 Eurocode 3-part 1-10: Design of Steel Structures: Selection of materials for fracture toughness and through thickness properties

Expected result at comprehensive level:

Review theory of fracture mechanics and brittle fracture.
Explain relationship between material fracture toughness and temperature.
Review calculation procedures in a relevant design guidance document.
Compute critical crack size for structural element with typical material properties.
Compute stress intensity factor for a welded connection.