Introduction to Steel Weldment Design Training Topics

A training course delivered by Matrix Engineering Consultants.

Introduction to Steel Weldment Design

The following is a summary of potential training topics that can be delivered to suit your company's or organization's specific requirements. Customization may include unique circuits, materials or conditions, particular problems, or other topics the client provides.

Module I: Introduction to Steel Weldments

- *Steel Weldment Advantages*
- *Design & Program Goals*
  - *Understanding the Customers*
  - *Product Program Types & Business Goals*
- *Weldment Functional Requirements*
  - *Space & Weight Constraints*
  - *Manufacturing & Assembly Goals*
  - *Quality Considerations*

Module II: Piece Part Design

- *Material Selection*
  - *Basic Steel Metallurgy*
  - *Impact on Fabrication*
  - *Physical Properties*
  - *Business Considerations*

- *Part Dimensions & Variability*
  - *Stock Material and Tolerances*
- *Part Design – Manufacturing Guidelines*
  - *Cutting Processes*
  - *Formed parts*
  - *Machining*
- *Fatigue and Stress Transition*

Module III: Welds and Welding

- *Welding Basics*
  - *Weld Terminology*
  - *Basic Weld Processes*
    - *SMAW*
    - *GMAW*
    - *GTAW (TIG)*
    - *FCAW*
- *Welding Professionals*
  - *People & the Knowledge they bring.*
- *Weld Basics*
  - *Weld Joints*
  - *Weld Types*
    - *Terminology*

        - *Geometry*
        - *Symbols*
        - *Selection- Which weld should be used?*
- *Weld Design Considerations*
    - *Accessibility*
    - *Position*
    - *Weld Distortion*
        - *Why Distortion Occurs*
        - *Methods to Control*
- *Models & Drawings*
    - *Clarity & Relaying Design Intent*
- *Weld Quality*
    - *What is a Weld Audit?*
    - *Using a Fillet Weld Gage*
    - *Basic Weld defects*

Module IV: Weldment Design Basics

- *Where to Begin - Selecting a Basis for Design*
- *Loads & Loading*
    - *When Loading Occurs*
    - *Determining Which Loads Affect Weldment*
    - *Determining Load Magnitude*
- *How to Begin*
    - *Space Constraints*
    - *Load Path*
    - *Section Property Basics*
    - *Initial Cross Section Sizing*
    - *Designing for:*
        - *Rigidity*
        - *Strength*
        - *Impact*
        - *Vibration*
        - *Fatigue Life*
- *Weldment Stress Transitions*
- *Weld Sizing*
    - *Practical Considerations in Weld Sizing*
        - *Maximum Fillet Weld Size*
        - *Minimum Fillet Weld Size*
        - *Weld Length Requirements*
    - *Sizing for Strength*
        - *Basics of Weld Failure*
        - *Static Loads*
        - *Fatigue*
        - *Weld Capacity*
            - *Treating Weld as a Line Design*

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Module V: Weldment Fatigue & Design Validation

- *What is Fatigue?*
- *Material Fatigue Life Curves*
- *How Welds Affect Fatigue in Weldments*
  - *Driving factors*
  - *Common initiation points*
- *Increasing Fatigue life through Design*
- *Overview of Weld Fatigue Life Estimation Methods*
    - *Determining Fatigue Load Cycles from Load History*
    - *Using Miner's Rule to Estimate Damage from a Load History*
- *Methods to Validate & Verify Weldment*
    - *What is Validation vs. Verification?*
    - *Weldment Verification Methods & Considerations*
    - *Understanding FEA /Test Results*
        - *Section Problem vs. Detail Problem*