Subassemblies

In subject area: Engineering

A subassembly is defined as an assembly that is included within an assembly or another subassembly.

AI generated definition based on: Design for Manufacturing, 2001

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Chapter

Assembly of ship structure

Subassemblies

When plates and sections have been machined (cut, bent, beveled, etc.) they are ready for assembly into two-dimensional ship units. Within the fabrication shop there are often arranged a number of bays for different assemblies, for example flat plate panels, curved shell units, matrix or 'egg box' structures and some minor subassemblies. All these may be termed subassemblies if they are subsequently to be built into a larger three-dimensional unit prior to erection. A two-dimensional plate panel assembly may be highly automated (see also 'Welding automation' section in Chapter 10) with prepared plates being placed and tack welded prior to automatic welding of the butts, after which the plates are turned and back welded unless a single-sided weld process has been used. The panel is marked and the stiffeners placed and welded automatically or with semi-automatic process. Marking and welding of two-dimensional panels is often robotically controlled. Minor subassemblies such as deep frames consisting of web and welded face flat are also attached at this stage. Curved shell plates are placed on jigs and welded, and the various stiffening members can be aligned and welded in a similar manner to those on a flat panel assembly. Assembly jigs may also be used for matrix or 'egg box' assemblies, for example structures of solid and bracket plate floors with longitudinal side girders that are to go into double-bottom units.

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Book

2012, Ship Construction (Seventh Edition)

D.J. Eyres M.Sc., F.R.I.N.A., G.J. Bruce M.B.A, F.R.I.N.A., MSNAME.

Chapter

Materials Engineering Considerations for System-Level Design

9.2.1 Develop Subassembly Concepts

As discussed in Chapter 2, the highest-level subassemblies are designed directly from the product's design requirements, with the specific product functionality of each subassembly determined by the design team. The designs of lower-level subassemblies and product elements are based on the design requirements for the subassembly in which they are used. The functionality and the other design requirements influence the physical construction of each subassembly, which includes its shape, dimensions, components, lower-level subassemblies, joints, and in-process structures.

Lower-level subassemblies within the highest-level subassemblies can be identified after concepts for the highest-level subassemblies have been selected. This involves dividing the highest-level subassemblies into portions that can be most easily designed and manufactured. Some products may have only one level of subassemblies. Other products will have many levels of subassemblies.

As a design team develops the concepts for the subassemblies, it must also define their design requirements. Also, the design team should start to record the information in a specification. All of the specification information discussed in Chapter 7 must be included. At this point in the process, a great deal of information about the design requirements may be missing. This information will be added as the design is refined during the detail design phase.

Designing subassemblies and defining their design requirements is an iterative process that requires trade-offs and optimization to arrive at subassembly designs that satisfy the product's design requirements. In fact, changes to the designs can continue into the detail design phase.

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2009, Materials Enabled Designs

Michael Pfeifer

Chapter

Materials Engineering Considerations for System-Level Design

9.2 Design Subassemblies and Product Elements

After a product concept has been selected, a design team begins the design of the major subassemblies that make up the product. Then, the subassemblies are divided into smaller subassemblies. Finally, the lowest-level subassemblies are divided into product elements. As this process progresses, the team defines the design requirements for the subassemblies and finally the product elements. Once these requirements have been defined, it is possible to identify the materials selection criteria for each product element.

The speed with which the materials selection criteria are compiled for each product element and the thoroughness and accuracy of the information depend on the team's level of knowledge about the requirements for the product and subassemblies. Incomplete information about these items impedes identification of the materials selection criteria because the design team will have to add the missing information while working on other aspects of product development.

An even worse consequence of missing or inaccurate selection criteria is identifying and selecting materials that will not enable a product's design requirements to be satisfied. In this situation, the product may not have the required performance, may not pass product verification testing, or may fail prematurely during customer use. If the product does not meet the performance requirements, the design team must decide whether or not to redesign it. If the product fails verification testing, then it must be redesigned and retested, which adds costs and delays the product launch.

Alternatively, the materials used may be more expensive than necessary because an engineer identified and selected materials with properties that exceed those required to achieve the desired product performance and reliability. As a result, either profit margins

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Types

5.2.4 Level 3 subassemblies

Von Hippel (1977) observed a long time ago that level 3 referred to an electronic subassembly. This level usually contains several PCBs, normally at least two bonded to a suitable backing (Tavner et al., 2010). This backing functions both as a mechanical subchassis that is a support frame as well as a heat sink as elucidated by Smith et al. (1991).

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Book

2019, Electronic Enclosures, Housings and Packages

DrFrank Süli

Chapter

Fabrication and installation

Movement, erection, and roll-up of subassemblies

To ensure good-quality construction it is recommended that the subassembly be welded at ground level or under cover. When such subassemblies are moved and installed into position in larger subassemblies or within the structure, care should be exercised to ensure that no members or joints within the subassemblies are overstressed or distorted. Suitable supports may include webbing slings, wire slings when the components are protected from damage, and temporary lifting attachments welded to the subassemblies. Subassemblies may be rolled into the correct orientation in the structure or to allow lifting at the correct orientation in the structure. Roll-up saddles shall be designed and positioned to ensure that the structure is not overstressed during roll-up and shall be well greased or otherwise lubricated.

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Corrosion and protection of the automotive structure

7.3.2 Subassemblies

In subassembly design is important to avoid complexity, because, as well as complicating the joining processes, the panel coverage by paint, waxes and wax injectants is inevitably impaired. If reinforcements are necessary on internal sections it is, therefore, a basic requirement that circulation is maximized by redesign and iterative testing to confirm efficiency of surface treatments (see below). The real danger areas are touching surfaces, which as well as causing paint depletion promote crevice corrosion.

Steps taken to improve paint coverage include the incorporation of fluted flanges (castellated sections 1.0–1.5 mm deep), which allow easier ingress of primer. Waxes have been developed to maximize spread without excessive drippage onto production areas where these are applied. Ideally, the hot wax application as introduced by Audi should be adopted, whereby injection is carried out under pressure into all underbody box sections, thus, forcing wax into most orifices and seams and retaining a thick film when the formulation cools.

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Geoffrey Davies

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Product Planning and Control Documents

7.4.2 Subassembly Specification

Subassembly specifications are written by Type I and Type II companies for subassemblies to be used within their products. A subassembly specification should contain the following information:

1. Description of the function of the subassembly
2. Scale drawing of the subassembly, including dimensions
3. List of the subassemblies and components within the subassembly
4. Performance requirements
5. Reliability requirements
6. Test methods for evaluating the performance and reliability
7. Applicable industry standards
8. Applicable government regulations
9. Intellectual property requirements
10. Sustainability requirements
11. List of materials used to fill joints and form in-process structures
12. Composition requirements of the materials used to fill joints and form in-process structures
13. Materials' properties requirements for joints and in-process structures
14. Microscopic structure requirements for joints and in-process structures
15. Requirements for the defects within joints and in-process structures
16. Joint and in-process structure performance requirements
17. Joint and in-process structure reliability requirements
18. Test methods for evaluating joint and in-process structure performance and reliability

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Fabrication and installation

5.5 Jacket assembly and erection

Subassembly can be considered as an intermediate stage between standard shop fabrication as joints, tubular members, beams, and assembly or erection. The work should be managed such that the maximum number of welds is done in the shop. As the shops have the highest weld quality many node and tubular welds can be double-sided and/or automatic when performed in the fabrication shop.

When defining subassemblies, the principal factors to be considered are the following:

- Dimension, size, and weight are the main factors governing the available methods of transportation.
- Subassemblies should not need a difficult welding sequence that can induce stresses during the subassembly welding or erection or avoid causing distortion to any members.
- Certain subassemblies may have specific construction difficulties associated with them, such as short, large-diameter infillings that are difficult to erect vertically and are best included in subassemblies, if possible.

The erection sequence shall plan the lift procedure for the fabricated subassemblies and loose items. In most cases, for a large jacket, there are four types of assembly as follows:

- jacket levels with their conductor guide frames;
- top frames;
- jacket rows, such as bents or partial bents; and
- pile sleeve clusters.

The assembly and erection phases are based on the following objectives:

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Chapter

Detail Design and Testing

10.3 Select Off-the-Shelf Subassemblies and Components

Off-the-shelf subassemblies and components are made by Type I companies and used in the other companies' products. Examples of off-the-shelf subassemblies include motors, pumps, valves, electronic displays, and computer hard drives. Examples of off-the-shelf components include fasteners, gaskets, electrical resistors and capacitors, and metal, plastic, and ceramic tubing. When selecting off-the-shelf subassemblies and components, the general goal of a design team is to choose items that consistently meet the product's design requirements.

Several materials engineering goals are associated with selecting off-the-shelf items. The first goal is to select subassemblies and components made of materials that enable the product being developed to meet its design requirements. The design team must verify that any material degradation that occurs during use will not prevent the subassembly or component from meeting these requirements. In some cases, the manufacturer of a component or subassembly will have conducted reliability tests on its product and can provide test data that demonstrate the product's reliability. In other cases, it may be necessary to perform verification tests on a supplier's product. Finally, the design team should verify that the materials meet all industry standards and government regulations. The second goal is to select subassemblies and components that can be easily and consistently joined to other components and subassemblies in the product being developed. A design team selects more than just a mechanical or electrical device when selecting a subassembly or component. It is also selecting secondary input materials to which a proper and reliable joint can be easily formed. These materials should be evaluated for their material features and whether or not a good solder, braze, weld, or adhesive joint

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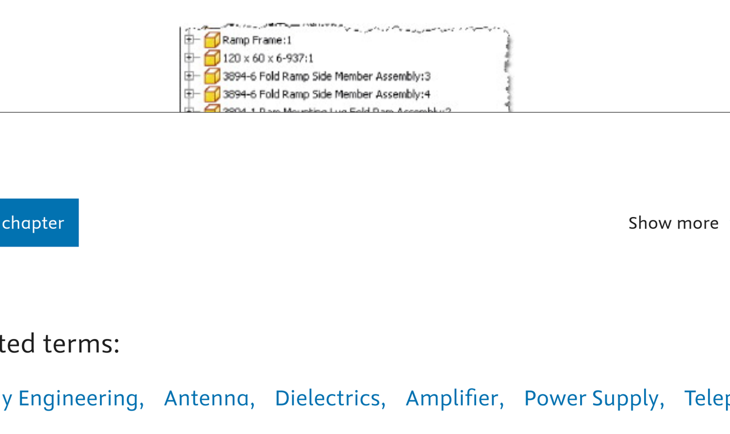
Chapter

DP3 – Size Multiple Actuating Jacks

Restructure components into subassemblies

1. Open *Ramp.iam*



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2. Select all the following components > Right click > **Component** > **Demote**

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