Draft of a model-like checklist for the implementation of DIN 2304

Implementation of DIN 2304 in practice
Workshop 8th September 2016
Fraunhofer IFAM, Bremen
Compilation of the checklist: Adhesive Bonding Technology
Content

- Classification of bonds as a function of the relevant level of safety requirements

- Requirements to be met by the process chain
  - Infrastructure
  - Staff
  - Checking the contractual provisions
  - Development and design
  - Subcontracting
  - Process design
  - Storage and logistics
  - Manufacturing
  - Maintenance
  - Monitoring of measuring and test equipment and of production aids and tools
  - Occupational health and safety and environmental protection
  - Quality management
Classification of bonds as a function of the level of safety requirements

- The designer or the person dealing with the component concerned shall classify the bond into one of the following safety classes, taking into consideration the potential effects of bond failure

**S1 High-level Safety Requirements**

Failure of the bond

- will directly or indirectly lead to an inevitable hazard to life or limb
- will result in a failure of the function, the effect of which will most likely lead to an inevitable hazard to life or limb
Classification of bonds as a function of the level of safety requirements

- The designer or the person dealing with the component concerned shall classify the bond into one of the following safety classes, taking into consideration the potential effects of bond failure.

**S2 Medium level**

Failure of the bond

- can lead to a hazard to life or limb;

- will result in a failure of the function, the effect of which will probably involve personal injury or result in major environmental damage;

- will result in a failure of the function, the effect of which will most likely involve major damage to property.
Classification of bonds as a function of the level of safety requirements

The designer or the person dealing with the component concerned shall classify the bond into one of the following safety classes, taking into consideration the potential effects of bond failure.

**S3 Low level**

Failure of the bond

- will result in a failure of the function, the effect of which will probably not involve personal injury or result in major environmental damage.
- will result in a failure of the function, the effect of which will affect comfort or performance at the most.
- will result in a failure of the function, the effect of which will probably not involve major damage to property.
Classification of bonds as a function of the level of safety requirements

The designer or the person dealing with the component concerned shall classify the bond into one of the following safety classes, taking into consideration the potential effects of bond failure.

**S4 No safety requirement**

Failure of the bond

- will result in a *failure of the function*, the effect of which will not, under *foreseeable circumstances*, involve *personal injury* or result in *environmental damage*
- will result in a *failure of the function*, the effect of which will *only* affect *comfort or performance*
- will result in a *failure of the function*, the effect of which will *not* involve *major damage to property*
Classification of bonds as a function of the level of safety requirements, Example Railway vehicles and parts

<table>
<thead>
<tr>
<th>Example</th>
<th>Safety/Classification requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front-/Side windows</td>
<td>high: A1</td>
</tr>
<tr>
<td>Doors</td>
<td>high: A1</td>
</tr>
<tr>
<td>Roof segments</td>
<td>high: A1</td>
</tr>
<tr>
<td>Side panel</td>
<td>high: A1</td>
</tr>
<tr>
<td>Interior</td>
<td>medium: A2</td>
</tr>
<tr>
<td>Floor adhesion</td>
<td>low: A3</td>
</tr>
<tr>
<td>Current collectors/collectors</td>
<td>high: A1</td>
</tr>
<tr>
<td>Pictograms</td>
<td>low/no A3/A4</td>
</tr>
<tr>
<td>Driver cabin</td>
<td>high: A1</td>
</tr>
<tr>
<td>Wet cell/wet room</td>
<td>medium: A2</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>
Infrastructure

- Manufacturing environment
- Transport
- Infrastructure, Maintenance and adaption
Staff

- sufficient qualified staff for the design, workmanship and supervision of the bonding process

- Bonding supervisors
  Example Safety class S1: the person supervising the overall bonding process shall be qualified as a European Adhesive Engineer, or comparable

- Bonding personnel: in general Qualification as European Adhesive Bonder
Checking the contractual provisions

- Are any required information provided by the contractor available?

- Application standards, specifications

- Definition of materials and surface characteristics

- Specifications regarding any surface treatment, bonding techniques, testing, equipment

- ...
Development and design

- Assignment to safety classes (Basis for the determination of all requirements; therefore listed at first of the checklist)
- Design of bonding
- Preparation of documentation for requirements
- Definition of adherends, adhesive, surface treatment
- Requirements to be met by the bonds
- Verification (stress < stress resistance)
Subcontracting

- All requirements for the final product are to be complied, irrespective of the external subcontractors
- Deciding on subcontracting in a transparent way
- Details and documentation of procurement
- Selection of suppliers
- Supplier management
Process design

Specifying the bonding process so as to ensure that the requirements to be met by the product or process are complied with in an efficient and reproducible way.

- Bonding as part of the overall manufacturing process
- Work environment
- Work sequence and manufacturing technology
- Production aids and tools (Capacity planning, Manufacturing documents)
- Process approval
Storage and logistics

- Incoming goods inspection
- Storage
- In-company transport
- Conditioning of materials
Manufacturing

- Process validation
- Periodic product validation
- Quality control
- Instruction of staff
Maintenance

Requirements specified for new bonds also apply to maintenance processes

- Assignment of safety classes
- Maintenance instructions
- Performing maintenance work
- Documentation
Monitoring of measuring and test equipment and of production aids and tools

- Monitoring measuring equipment
- Monitoring bonding equipment
- Monitoring test equipment
Occupational health and safety and environmental protection

- Legal requirements
- Regulations of the industrial employers’ liability insurance associations
Quality management

DIN 2304 is to be integrated into the contractor’s quality management system (QMS).

- Quality planning
- Control of planning and manufacturing documents
- Documentation, marking, traceability
- Document and knowledge management
- Communication system
- Action in the case of deviations
- Change management
- Control of non-conforming products
- Preventive and corrective action