

DESIGN CHALLENGE

BoM Template

User Manual 2021

IMechE DESIGN CHALLENGE

GUIDANCE FOR ALL PROJECTS



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Please check the IMechE Design Challenge website for updates.

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Version	Page	Details	Date
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1. Introduction

There is no single answer as to what a part numbering system should be, because it is impossible to define a 'one size fits all' solution. Companies around the world have adopted methods that suit their own way of working. They will all have common features; to allocate a unique identifier to each part and ways to keep track of changes. A simple system is presented here for use in the IMechE Design Challenge competition.

The Bill of Materials has been introduced so that young engineers get an appreciation of the design data that is needed in industry. CAD data alone is not enough. The most important aspect is to understand that items need to be identified by more than just a description. There is no requirement for producing technical drawings for the IMechE Design Challenge.

2. How to Use the BoM Template

The BoM Template includes a sample tab (called 'AB20 - Angle Bracket Example') to help with learning how a BoM is constructed and to familiarise yourself with the information that it contains. In the cells for the headings in Row 8, there are embedded comments to describe what each entry means.

You should compare the BoM with the matching CAD assembly that has been provided. This will help you to understand how the BoM and an assembly are linked. This is an arbitrary assembly that contains a selection of sub-assemblies, parts and standard parts. Note that the assembly file is in STEP format, which is the same format you should use for submitting your CAD model.

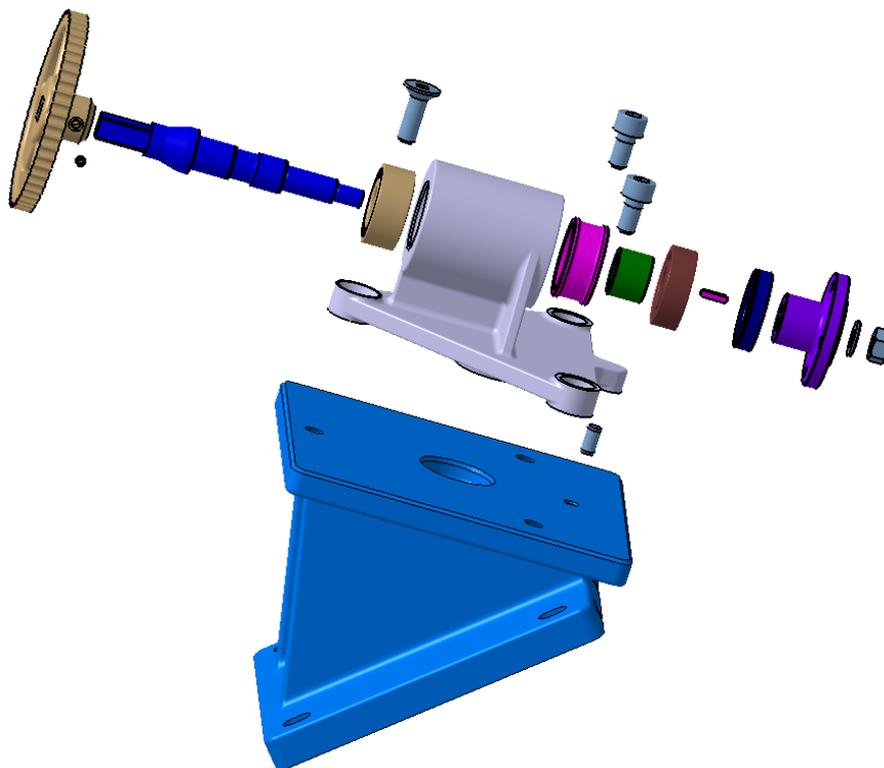
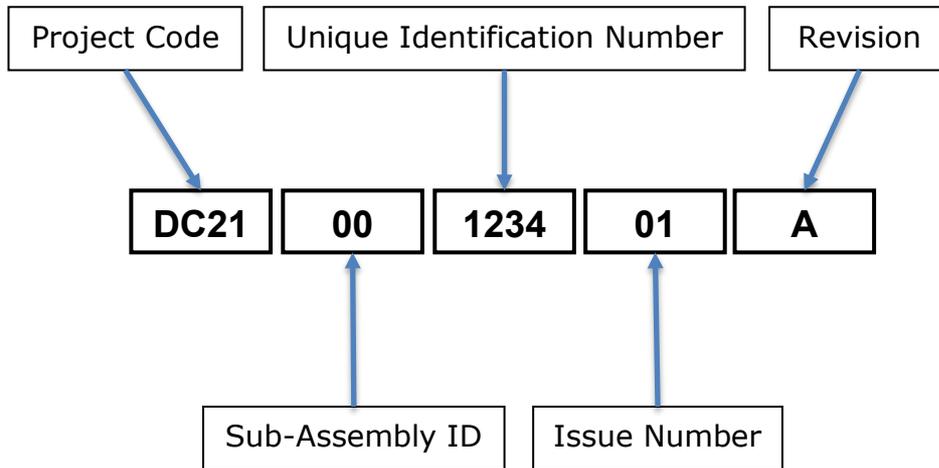


Figure 1: Exploded view of the sample assembly supplied with the Bom Template

You will be required to create a BoM for your IMechE Design Challenge device using the Blank Template tab in the BoM spreadsheet. Please follow the instructions in the BoM and remember to delete the first tab before submitting.

3. Anatomy of a Part Number



A full part number is often built up of a series of identifiers as follows:

Project Code

This can be any sensible reference you choose. In this example, the project was to produce an Angle Bracket assembly. It was created in 2020, so the project code has been chosen as 'AB20'. Anything that suits a particular project could be used, with an alpha-numeric combination of characters, usually no more than 4 characters long. There is no right or wrong answer and you will find many ways of doing this in industry.

For the IMechE Design Challenge, please use the following format for your Project Code to help with identifying individual teams. Use the respective 3-letter university code listed below, followed by a team identifier. Please use either 1 & 2, A & B, or 1 & A if you don't want to create a hierarchy.

For instance, MDX1 would be Middlesex Team 1, QMUB would be Queen Mary Team B, etc.

University codes:

BRN	Brunel University London	LSB	London South Bank University
COV	Coventry University	MDX	Middlesex University London
CTY	City, University of London	QMU	Queen Mary University of London
DUR	University of Durham	STF	Staffordshire University
GRE	University of Greenwich	UCL	University College London
ICL	Imperial College London	UEL	University of East London
KNG	Kingston University	UNH	University of Hertfordshire

Sub-Assembly ID

For a small assembly such as an IMechE device, keeping track of all the parts in a single list is fairly simple. Imagine something far more complex, such as an aeroplane. It would make far more sense to break the whole assembly into identifiable sub-assemblies, such as the wings, fuselage, tail and so on. These would then be broken down into further sub-assemblies. This makes the task of design, manufacturing and assembling them more manageable.

BoM Sections offer a way of tracking sub-assemblies. In the simple Angle Bracket example, the top line assembly is 00, with three sub-assemblies 01 to 03. If you check the accompanying CAD model, you will be able to identify these sub-assemblies containing only the parts with the same BoM Section identifier. There is no right or wrong answer as to how you define sub-assemblies, and you will find many ways of doing this in industry. However, the clue is in the name; a sub-assembly should, ideally, be a collection of associated parts.

Types of Parts

As Assembly is typically made up of the following items:

Part – a unique item, designed and manufactured to your drawing. These are things that you will create for your device that do not already exist and cannot be bought immediately as finished items from a supplier.

Standard Part – these are made in their millions around the world by numerous suppliers. They will be made to an agreed standard, so that no matter where they are made, they will be identical. Nuts, bolts and fasteners are good examples; the list of Standard Parts is extensive. They are usually available as catalogue parts in CAD systems for inserting into your design, so that you don't have to spend time modelling them. If you don't have access to these catalogues in your CAD system, then you can download the models you need from supplier websites.

Procurement – this will be a manufactured item that is unique to a certain supplier. A good example is an electric motor. Although motors from different suppliers will be similar, they are unlikely to be identical, so can't be classified as Standard Parts. Wheels and tyres are also good examples. In all these examples, you will know the sizes, or performance characteristics, you require, but you won't have to create your own design and manufacturing drawings because the items already exist.

Standard Parts and Procurements are commonly known as off-the-shelf components and you may see them referred to as COTS 'Components Off-The-Shelf' in some BoMs. In this competition, please keep the distinction between Standard Parts and Procurements in your BoM.

Assembly – this is a collection of Parts, Standard Parts and Procurement items. Assemblies can also include Sub-Assemblies.

Unique Identification Number

Every part needs to have a unique number assigned to it. For designed Parts, design offices will have a system to help them do this. Having a unique identifier helps with the engineering process from design, to purchasing, manufacturing, stock control and assembly. A 4-digit number will more than suffice for a university project like this.

Assemblies, Sub-Assemblies and Parts should be assigned numbers starting from 0001 in ascending order. With inexperience, it is often tempting to try and assign parts in an

assembly with consecutive numbers. It won't be long before you find an additional item needs adding that spoils the numbering sequence! You may then decide to renumber all the parts to regain your neat numbering. Consecutive numbering serves no useful purpose, to avoid falling into this needless trap.

Standard Parts and Procurements often cause issues in the real world. If a certain bolt is assigned a Project Code and Sub-Assembly ID, what happens if that commonly used item is then used in another sub-assembly in the same device, or in a totally different project? This can be confusing. For that reason, companies often devise their own method for numbering standard parts and procurements so that they can be shared openly across many projects. For your device, it is your choice as to whether you assign a project code and unique identifier. This will work because you are only producing a single device, so there won't be any confusion. Alternatively, you may choose to use the supplier's part number. In the AB20-Angle Bracket assembly, Standard Parts have been identified using a system based on the ISO, or DIN, standard for that item. You don't need to do this as it is more complicated than you need.

Issue Number

It is important to keep track of changes when a Part is revised. The Issue Number will change when the part physically changes. You will often hear designers referring to 'up-issuing' a Part, which means a change has been made to the design.

For Parts, the convention is if the Form, Fit or Function changes, then the CAD model will need up-issuing. In simple terms, if the new version is not interchangeable with the old, then the issue number will change. Changes to Assemblies and Sub-Assemblies will also need tracking in the same way.

Assemblies, Sub-Assemblies and Parts will have their issues numbered 01, 02, 03 etc. as they are updated.

Procurement items may also have an Issue Number, if the supplier updates their part.

Standard Parts will NOT have an Issue Number.

Revision

The revision is tracked on drawings only, and it changes every time a revised drawing is released.

If only the part changes (Issue Number), then the released drawings would go in the sequence 01A, 02B, 03C and so on.

The Issue Number doesn't always have to change when a part revision is made. For instance, you may have a drawing where you missed a dimension or want to add a manufacturing note. The drawing would be amended (no change in Issue Number, because the Part is still the same) and so the Revision alone is changed. In this instance, the CAD model would remain the same.

It should not possible to change the Issue Number without the revision updating as well. For instance, 01A to 02A is not recommended as is 02B to 03B etc. However, yet again, you will find companies have their own ways to do this. There is no standard that has been universally adopted.