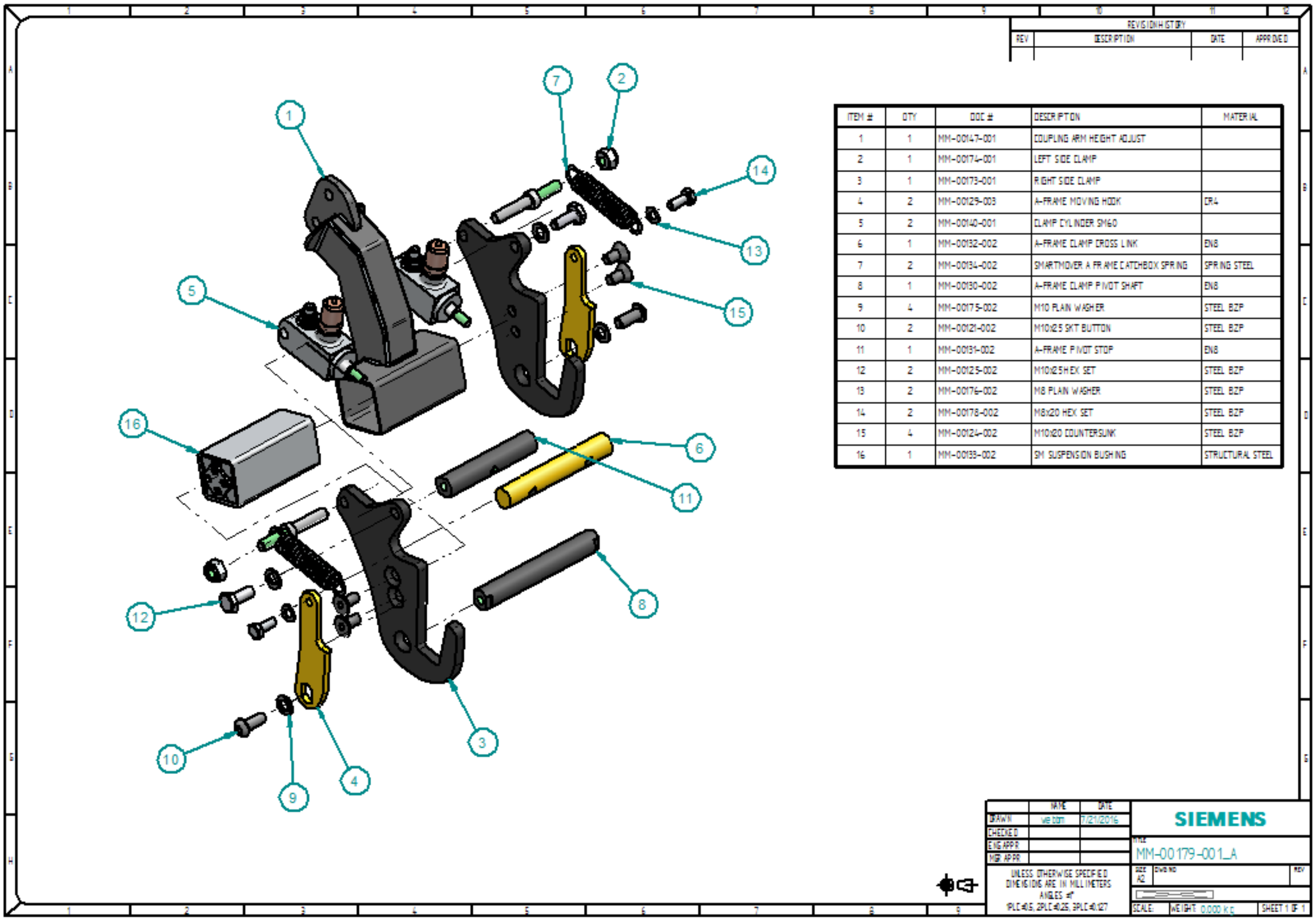


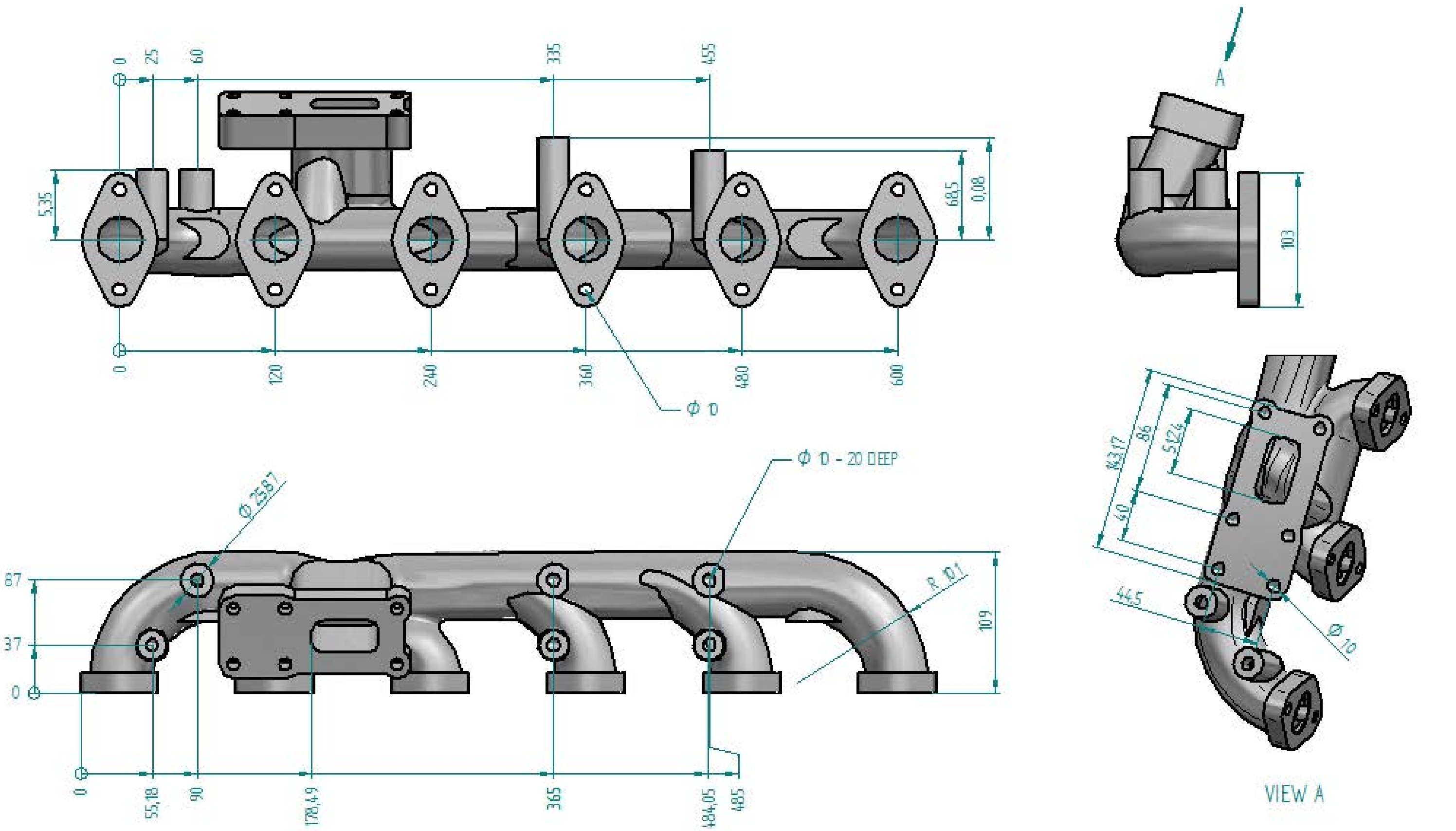
THE IMPORTANCE OF DRAWINGS

WHEN IT COMES TO ESTABLISHING THE REQUIREMENTS FOR PARTS WHEN MANUFACTURED, THE TECHNICAL DRAWING STILL REIGNS SUPREME. WITH THE ADOPTION OF 3D MODELING AS THE MEANS FOR PRODUCT DEFINITION, HOW CAN WE ENSURE A CLEAR WORK FLOW?

There's no doubt that the world of design and engineering has been through a lot of changes in the last two decades. The rise and adoption of 3D modeling technology has revolutionized how many organizations design, engineer and manufacture their products. Not only internally, but also collaboratively when conducted with their customers and suppliers.

While this is all true, it's a curiosity that the primary document that provides the distillation of all of that effort and knowledge to get those products into manufacturing is the technical drawing. Why is this the case?

The answer is complex. The digital 3D model affords us huge benefit in terms of digital creation, test and simulation, that much is accepted. Much of the reason for the reliance on the drawing is that the 3D CAD model is the nominal; the perfect specimen. It doesn't communicate where dimensional and tolerance constraints lie, it doesn't



give us much in the way of hard facts about how the parts needs to be manufactured. This is where the two dimensional, orthographic drawing comes into its own.

By breaking down the complex 3D model into individual orthographic 2D views, it allows us to detail dimensions, tolerances and much more manufacturing information that's not readily defined by the 3D model and its associated geometry.

It's the combination of the two (the 3D model and associated set of drawings) that allows us to define this critical information and to communicate it where needed. With that in mind, how can we ensure that the process of design, documentation and manufacturing is as efficient as possible?

Here are three key aspects to consider when looking at your drawing and documentation process, how best-in-class design systems can assist you and what to look out for.

#1 ACCURATE DRAWINGS & DATA

The first and foremost reason to use integrated 3D modeling and 2D drawing creation is accuracy. By taking your 3D model and using this as the basis for your drawing view geometry, accuracy comes for free. It removes ambiguity and the potential for human error and makes the whole process much more efficient.

Of course, there's still a lot of manual input into the process, but this can focus on the addition of those all important dimensions, tolerances and annotations that convey manufacturing and production intent.

Best-in-class systems allow you to adapt the drawing view to your requirements, whether that's driven by national or international standards, industry specific standards or internal best practice.

It's also worth considering the use of a template driven approach to further automation. Whether that's the layout of specific part views, sections and detail views or the formatting and positioning of tabular data (for BOMs, hole tables etc.).

Where things really get interesting is, as ever, during those late stage design changes, where part geometry has been edited. In a traditional work-flow, where geometry and drawing are disconnected, this means a lot of work to generate new drawing views then recreation of annotations and dimensional information.

In the integrated 2D/3D world, this also comes for free. Part and assembly data changes and the drawing view can be updated to propagate those changes - quickly and efficiently.

#2 COMMUNICATION

When all is said and done, a technical drawing is about communication - communication of manufacturing intent.

To do this effectively, we need to be sure that our drawings contain all of the information required to efficiently manufacture the parts in question within the tolerances required. To achieve that clarity of communication, we need to be able to create drawing views as required, rather than limited by the functionality of the authoring system.

Here, the auxiliary drawing views come into their own. Whether that's broken views, detail views, sections or exploded views. This also needs to be backed up with a rich set of annotation tools - this need to not only extract information from the 3D model where needed (such as hole centres, threading details), but also ad-hoc notes and other information where needed.

Once complete, we need to be able to send that information to those that need it - whether they're inside our organisation (to purchasing, to the shop-floor), or other stakeholders in the process, such as suppliers, customers and other partners.

A best-in-class system should allow an organization to share its drawing data quickly and, just as importantly, securely. That might be done using printed matter, but more likely using electronic means. The ability to generate data that's readily viewable (using a PDF or, perhaps, native formats using a freely available viewing application) is essential.

#3 COMPLETENESS

The final thing to consider is completeness. After all, if the sets of drawings we create doesn't contain all of the information we need, then the whole process breaks down. Drawings are part geometry and part annotation.

To ensure that we provide all of the documentation we need, we need to have complete drawings - otherwise the potential for error increases - and, as is well established, with errors that are found later in the production process, the costs are astronomical compared to fixing them in the design phase.

It's here that best-in-class systems can really prove their value. It's those smaller details that can really make a difference.

One example to consider is the ability to automatically extract an accurate Bill of Materials or Parts list, including any non-drawn parts, and place them in the appropriate drawing sheets, retaining the link back to both the

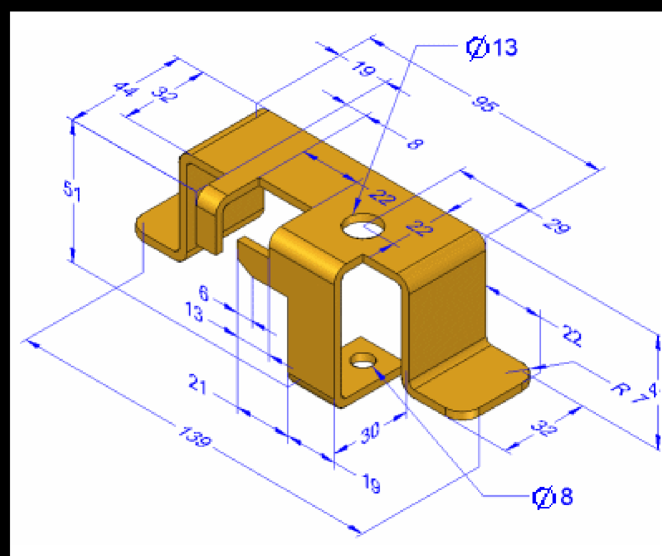
THE POTENTIAL FOR 3D DRAWINGS AND PRODUCT MANUFACTURING INFORMATION (PMI)

What if we could combine the accuracy and unambiguity of 3D models with the richness of technical documentation methods typically found in drawings?

The answer is that the technology and use case already exists in the form of Product Manufacturing Information (PMI) or 3D annotation.

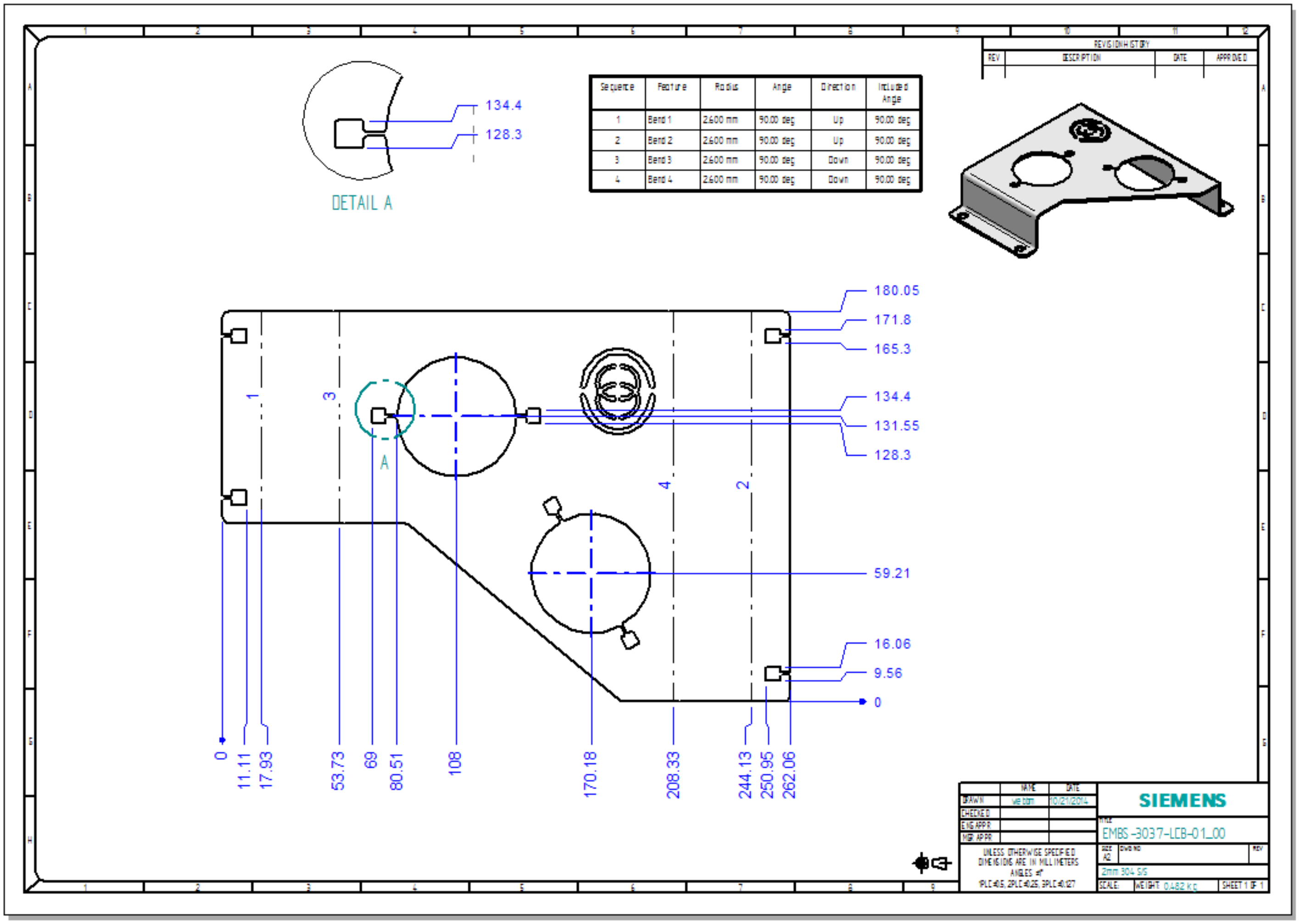
This combines a 3D model with a set of tools that allow us to create rich 3D models that not only contain the accurate geometry of the part in question, but also a method of detailing and documenting the GD & T that not only contains the dimensional requirements, but also datums, tolerances and other critical manufacturing information required to manufacture parts that are within specification.

Each model is associated with 'model views' that allow the user to define and present that information directly on the model, using industry standard annotation methods (as defined by standards such as ASME 14.41, DIN ISO 16792 and other international standards).



One of the benefits of this model led approach (often referred to as Model-based Definition or MBD) is that those annotations remain associative during any design change process and stay live. It can also then be reused during the traditional drawing creation process, with best-in-class systems, that allow you to load the model into a drawing template and automatically extract any PMI in the required drawing views where needed.

Clearly this allows consumers of that data (whether on the shopfloor, in the CNC programming office, or at a supplier) to view it in the best format suitable to them and again, reuse it quickly and efficiently.



originating assembly and any data management systems in place.

It's also worth considering more special purpose information - particularly when discussing specific manufacturing processes. Sheet metal is a good example, as the ability to extract bend tables, as shown above, or hole tables, when hole size and other characteristics need to be presented in a tabular form on the drawing.

A best-in-class system will allow you to create this information quickly, accurately and with the flexibility that the design to production process demands.

Forms of 3D content sharing are still new and there is reluctance to trust them. Even though the PMI tools are based on similar standards to traditional drawings. There is an undeniable learning curve to know how to use the tools to make viewing easier.

We are not at the point where organizations and suppliers consider 3D content in the same light as drawings. Drawings are still easy to understand and provide a contract between the two parties, whether that's between internal departments or between a customer and supplier.

SOLID EDGE

Drawing creation has been a key focus for Solid Edge since its inception. Drawing view layout can be driven by templates and the system includes a rich set of technical documentation and annotation tools to fully detail your parts and assemblies.

In addition, recent years have seen the introduction of PMI support for storing this type of information directly on the 3D model, then extracting that data further downstream.

CHECK OUT THE SOLID EDGE FREE TRIAL AT:

siemens.com/plm/try-solid-edge