



# The Micrometer

AUCKLAND SOCIETY OF MODEL ENGINEERS INC. | Issue 699 | April 2024 | [www.asme.org.nz](http://www.asme.org.nz)

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## *Inside this issue*

**Presidents Report** - April 2024 – Easter hops around again.

**Clubs Monthly Calendar** – What’s on near you.

**Train Roster** – Are you Next?

**What Is GD&T** – Improve your Drafting

## *Presidents Report*

Hello everyone

Easter is just around the corner, and so is our renewed run for the Panmure Basin Day Festival on the 14<sup>th</sup>! We'll be running the same way as we planned to do last time with a morning crew and an afternoon crew. Lunch will be available in the middle, so crew coming off can have a bite to eat and crew coming on can also eat before starting.

Additionally, it's come to the attention of the committee that with the moving on of some of our members, the gardens are in need of some assistance in its maintenance. Bruce Matchett has worked tirelessly over the last several years to keep them in good order with help from members, but it's not a solo operation. If there is anyone who would like to help out with this then we would greatly appreciate it, as it is only a few hours each week. The committee is open to bringing in a professional gardener at cost if required, but we felt it best to ask our members first. Naturally, tools and equipment would all be supplied, we just need some help to keep our beautiful lands the way they are!

I would also like to remind all of our Sunday running members of the importance of maintaining a healthy work/break balance. I am thankful for all of the effort everyone puts in to make it an enjoyable ride for everyone on a Sunday however please remember to take your afternoon coffee break! Nobody should feel pressured to keep driving while they are supposed to be having their break. If this means that one of the electrics needs to be paused and the passengers have to wait a bit while the crew numbers shortly go down, then in the interest of safety that is what should happen.

MEANZ has submitted to us a revised daily running checklist. The committee will be reviewing it and we may have to make changes to the document that train controllers are filling in each Sunday. However none of the changes are egregious and they appear very reasonable. We have an excellent relationship with MEANZ and we are thankful in their help for keeping us up to date on any new changes that come down from the government and WorkSafe with regards to our operations.

Finally, Mike Banks and Steve Watson have been hard at work building the track going inside the extension for the engine shed which will house the leaf sucker. I'm looking forward to seeing the final result!

Thanks

Philip Dowdeswell

## *This Month's Calendar*

Tuesday, April 2 <sup>nd</sup>	7:30 pm	General Meeting, (Clubhouse)
Tuesday, April 9 <sup>th</sup>	7:30 pm	Workshop Night, (Clubhouse)
Tuesday, April 16 <sup>th</sup>	7:30 pm	Committee Meeting (clubhouse)

# Train Roster



Date	Electric Driver	Electric Driver	Steam Driver	Train Controller	Station Guard 1	Station Guard 2
7-Apr-24 10AM	D Housley	B Matchett	Voluntary	<u>B Aickin</u>	M Luxton*	B Leung
14-Apr-24 1PM	R Reichardt	B Matchett	Voluntary	<u>P Dowdeswell</u>	R Crook*	S Watson
14-Apr-24	J Lankow	R Shearer	Voluntary	<u>P Dowdeswell</u>	K Ryan*	S Watson
21-Apr-24	M Moore	A Van Zon	Voluntary	<u>P Dowdeswell</u>	R Souter*	B Matchett
28-Apr-24	R Reichardt	M Vickers	Voluntary	<u>T Lawrence</u>	C Billiau*	C Whitisie
5-May-24	I Ashley	B Matchett	Voluntary	<u>S Meikle</u>	R Crook*	S Watson
12-May-24	D Housley	R Shearer	Voluntary	<u>G Wills</u>	M Luxton*	H Dando
19-May-24	J Lankow	M Plant	Voluntary	<u>B Aickin</u>	K Ryan*	B Matchett
26-May-24	M Moore	A Van Zon	Voluntary	<u>P Dowdeswell</u>	R Souter*	R Shearer

Due to the postponement of the Panmure lagoon day  
The day has been moved to the 14<sup>th</sup> of April. Please  
Note the two teams and start time running that day.  
Lunch will be provided.

## Please Note:

If for some reason you are unable to attend on your rostered date, you are respectfully reminded that it is your responsibility to find a replacement member to fill the gap – please don't let the rest of the team for the day be left short-handed.

Note: The Train Controllers for both affected days must be informed of the swap in advance. It is the responsibility of the person who initiated the swap to do this. Also advise Bob Aickin who is keeping track of the number of duties each of us perform during the year

# Club Notices

## ***Model Engineering Journals***

ASME has an extensive range of Model Engineering Journals (ME and MEW) in the library, managed by Mark Luxton. The collection goes back to the first editions. However as new copies arrive binding takes a while, so the latest may not be available for a while.

If you would like to read the latest edition, they are free to borrow electronically from Auckland Public Libraries. The easiest way to borrow them is using the LIBBY app. If you are a member of the Auckland Library System (anywhere in the SuperCity), this gives free access to an ME and MEW e-sub. If you encounter difficulties take your device (an iPad is ideal) into any Auckland Library Branch.

Please let the editor know if you have been using this service successfully, or have encountered any difficulties.

## ***Private Track Hire***

We have had a request from Playcenter Auckland for a running on May 2<sup>nd</sup> and would appreciate any volunteers who can come out and help at 10am for a two hour run. It's an excellent opportunity to showcase our support to our local communities! Please contact Philip Dowdeswell if you are able to help!

## ***Club Badges***

As a reminder to all members, the price of badges has risen following increased costs from our supplier. It is now \$3 for a badge and \$5 for two badges.

## ***Radial Engine Project***

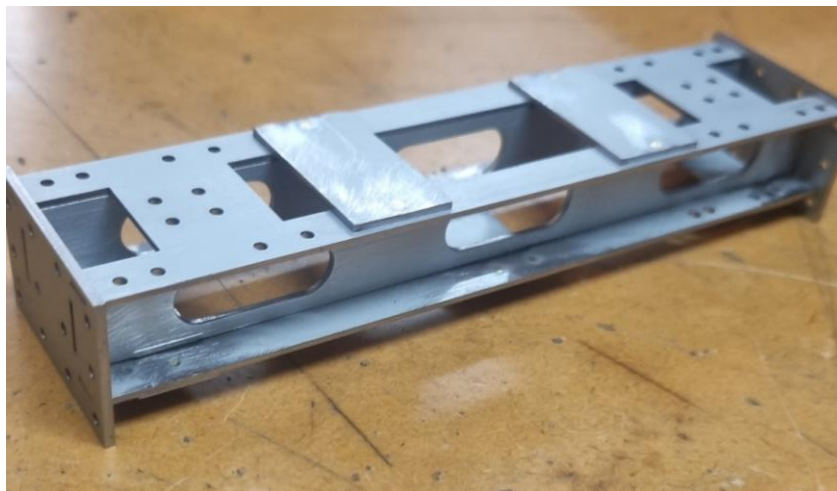
Mike Clayton purchased the full set of plans, procedures and rear engine casing to make a Lee Hodgson 9-cylinder Radial engine. However he no longer has the time to make it. If anyone would be interested in purchasing it, please contact Philip Dowdeswell so he can pass on Mike's details.

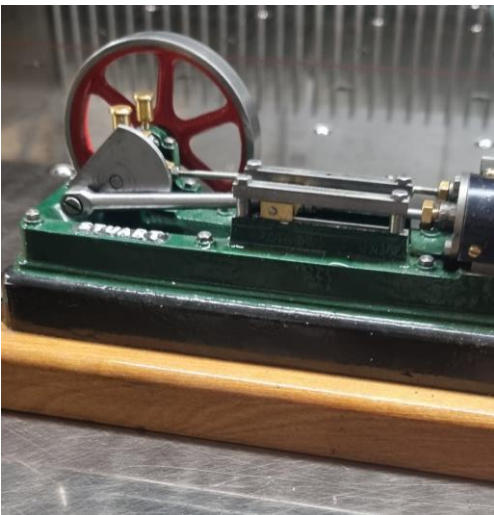
## ***Workshop Night***

This month's workshop night was hosted by one of our newer members Steve Watson. He is setting up his workshop at his business and has a dedicated tidy workshop to put on show. We had several members turn up and were given a run down about his set up.

Members had brought in various items that they were working on from beautiful clocks from Michael Cryn, items manufactured using lost wax casting and cnc machining the final intricate features from Mike Jack to buffer beams fabricated using CAD drawings to enable laser cutting and pieced together for final weld or silver solder from Martin Plant. Steve Watson had his turner steam engine running for us to view. Finally we had a couple of lucky dips. Boscoe Leung brought in a box he bought in the auction with four or five hot air engines in it. He thinks he has too many projects going on so has donated them to the club membership if someone is keen to carry them on. The condition is you must take them all they will be at the club at the general meeting. Roger also bought a box of bits from the auction that was surplus to his requirements and we had a bit of a share out.

Thanks Roger and thanks for the hospitality from Steve Watson.



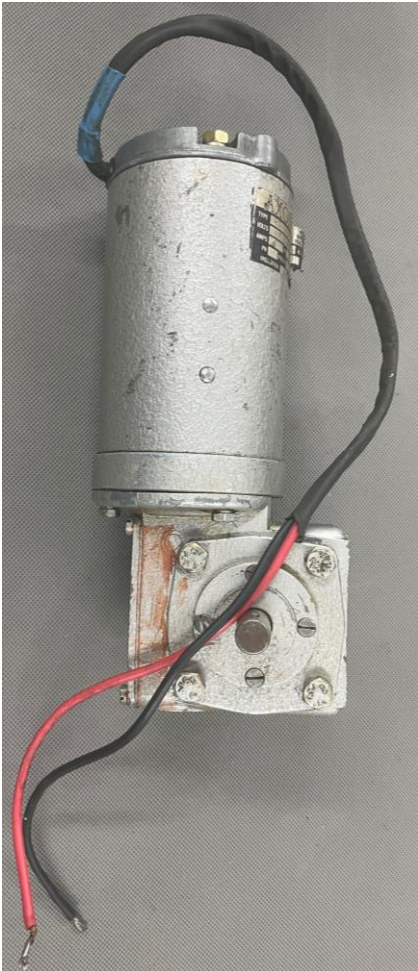


## Bits and Pieces

Greville brought in parts of motors from his newly bought locomotive. The grease on it was old and dry, but after cleaning it up and testing it, it works great as a 12v motor!

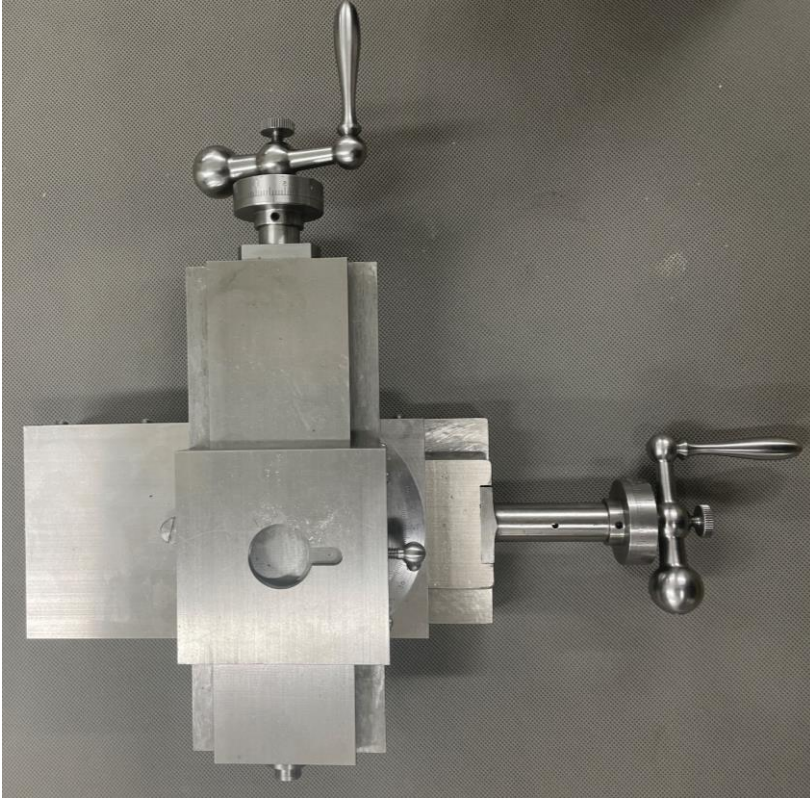
Additionally, after running it on a Sunday the controller got very hot and had some operational issues. After making a finned heatsink and a snorkel attached to a fan, the thermal issues appear to have disappeared.

Greville also brought in the drivers for some Sonos speakers from a broken set. After some difficulty opening it (and breaking the long since expired warranty) he is fascinated with their operation.



## Bits and Pieces

David Watts brought in a cross-slide topside for a lathe that he has been working on. After some time of it sitting in his garage, he has started repairing it and getting some new components after its hard-working life.



Bob has made the shaft that links from the central bogie to the motor - he's proud of his "bush blacksmith" tooling!





## Bits and Pieces

Dave has started making the coupling rods for his locomotive. The conrods are complete

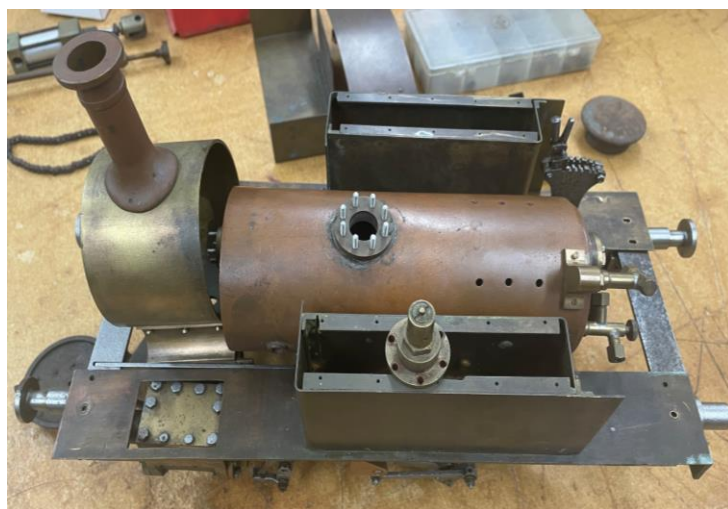


Grant has modified his spare wheel for Bjax locomotive. The counter balance on it needed some more weight. He had to trim the insides of the rods so that the enlarged counterbalance didn't hit it when turning



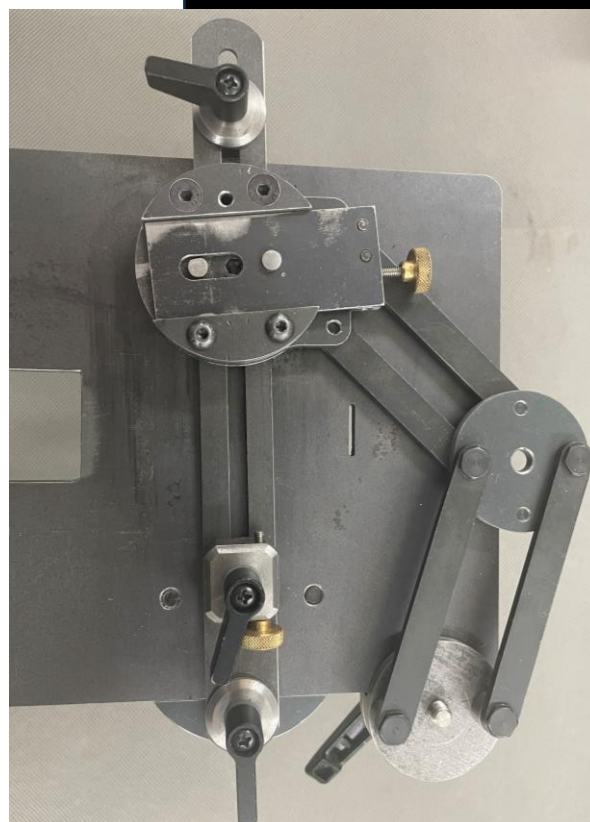
## *Bits and Pieces*

Bosco acquired an air compressor and a partially built Titch frame and boiler and was seeking some assistance in getting the frame attached to an air compressor for testing.



Steve brought in some early days work from when he was learning milling work. In his learning he managed to burn out many pieces but has improved significantly with time.

Bits and pieces written this month by Philip Dowdeswell



# Leaf Sucker

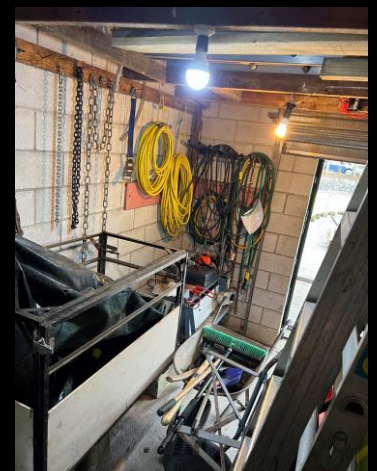
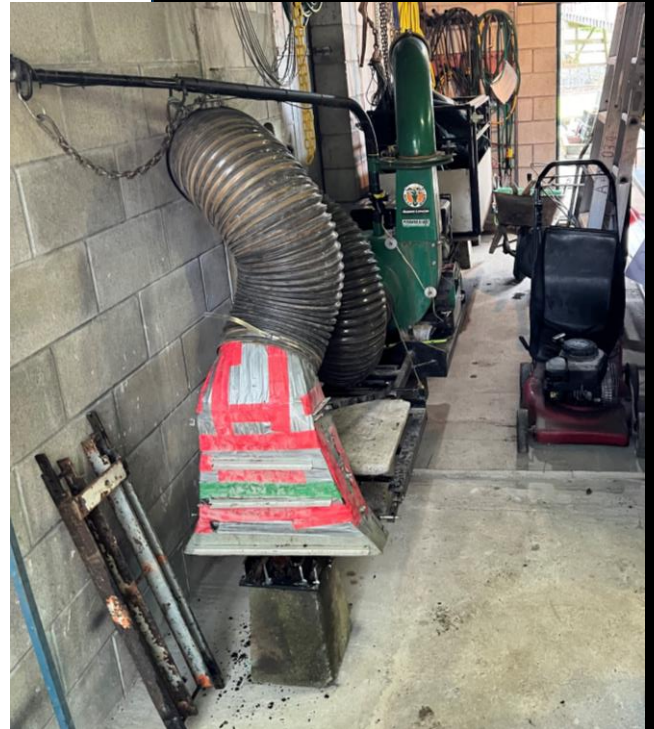
A bit of welding, some heavy lifting, smashing a wall out (Well, SAFELY removing a section of wall) and some grunt work later, the leaf sucker has it's new home inside the engine shed!

Thanks to all of the crew who were able to come out on Saturday at the working bee to do the final sections.

The Leaf sucker has also completed a full rotation of the track, so we know that it's fully capable of doing the job that it was built for!

The shed track has been raised up on concrete blocks to better line up with the track outside, not unlike how our railway used to be laid out around the track!

A heavy door sits in place to prevent unwanted entry during closed periods and a small piece of track is laid in place to bridge the gap when the door is open, much in the same way as the rest of the shed tracks for the yellow motorized traveller.



# What is GD&T Part 2

Have you ever spent countless hours pondering how to accurately dimension a drawing or convey critical design information to a workshop only to have you loco part not turn out how you envisaged?

In this series we will dive into the world of GD&T and how you can apply it to you drafting.

Written by: Cameron Billiau

GD&T stands for **Geometric Dimensioning and Tolerancing**. It is a system used in engineering and manufacturing to communicate and control the dimensional and geometric specifications of a part. In this instalment we will start to cover actual symbols you may see on a drawing and some ways they can be used and what you can control. So lets dig in and start with datums.

When you create a feature control often, they will be with respect to a datum. Just to confuse you after we look at datums we'll go over drawing controls that don't require a datum 😊

In the most basic form, a datum is the controlling feature your GD&T callout is referenced to. This datum is what is held when the part you haver created is measured. So, you can have multiple datums on a part. Primary, secondary, and a tertiary datum *figure 1*.

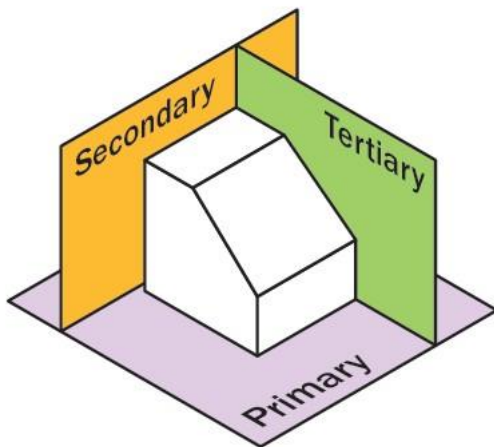


Figure 1

So you need a datum. You know the surface you wish to add a datum to. But how can you represent a datum on a drawing! A datum can be placed on two main features:

1. Surface features
2. Features of size.

# What is GD&T

A technical drawing says a thousand words so let's start there. Figure 2 shows how a datum can be placed on a surface feature of a design. Now you wouldn't have six datum features on such a simple shape! What I have done is added a few datums with different leaders or positions and lettered them in sequence to give a quick example on how to place each datum what it means at its location and how it called out.

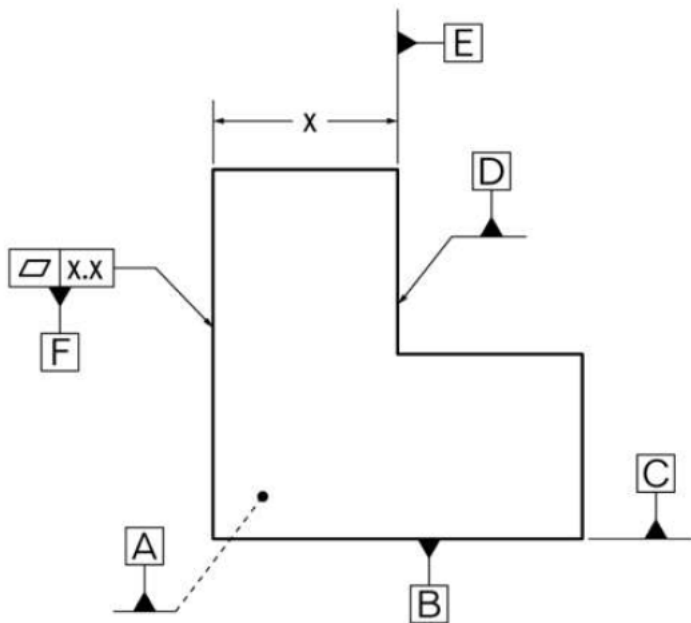


Figure 2 – Datum placement on surface features.

- A.** Datum **A** is calling out the top surface of the part. It can be placed with a solid or dashed extension line and the datum symbol placed on it.
- B.** Datum **B** is placed directly on a planar surface. This tells you this surface is a datum on this part.
- C.** Datum **C** is placed on an extension line off a datum surface. This would also be a suitable call out and is controlling the same surface that datum **B** would.
- D.** Datum **D** is placed on a leader arrow pointing to a planar surface.
- E.** Datum **E** is placed on a size dimension however offset to the dimensions arrow. This would control the same surface that datum **D** does.
- F.** Datum **F** is placed off a feature control frame that is a surface control (Flatness). Datum feature is geometrically controlled but you have called it as a datum surface.

# What is GD&T

Figure 3 now shows six datums on features of size. Now you wouldn't want to have six datum features on such a simple shape! Again, what I have done is added a few datums with different leaders or positions and lettered them in sequence to give a quick example on how to place each datum what it means at its location and how it called out. Here we should mention the more datums and GD&T a part has the harder it maybe to manufacture and produce and cost. So a smart designer or engineer wants just enough to enable repeatable manufacture but keep costs down.

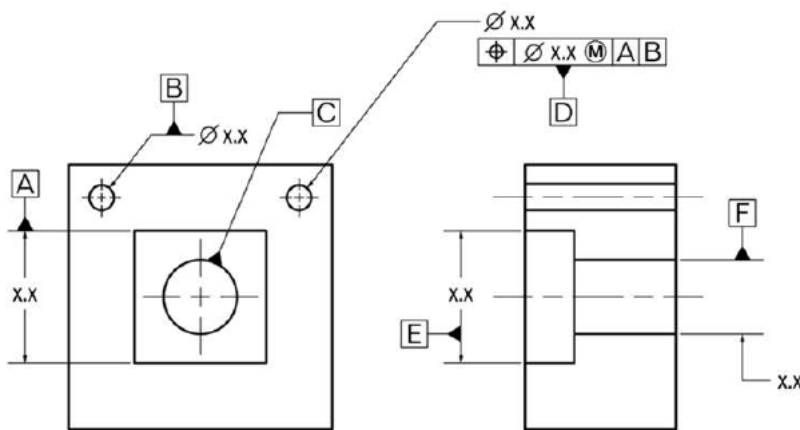


Figure 3 - Datums on a Feature of Size

- A. Datum **A** is placed on a dimension line directly above an arrow. This means the feature with the size is the datum!
- B. Datum **B** is placed on the leader arrow of a size dimension.
- C. Datum **C** is placed on a non-planar feature of size.
- D. Datum **D** is placed on a feature control frame that is controlling a feature of size. Making it a datum.
- E. Datum **E** is placed on arrows of a size dimension.
- F. Datum **F** is on one half of an open-ended size dimension inline with dimension arrow opposite. Thus, making this bore a datum.

You can see now that how and where you place a datum even on a dimension line can change what the datum is and how you would measure the part post manufacture.

So, after you have placed a datum or two on your part and some dimensions. You then think "How can I control the **form**?" Well there are four main GD&T symbols/call outs that control form of a designed part. They are:

1. Straightness
2. Flatness
3. Circularity
4. Cylindricity

# What is GD&T

If you recall back to the last article that covered maximum material and least material condition. Out of the four controls you can use for form; Only Flatness and Straightness can be used with a modifier condition such as maximum material condition.

So, Straightness how do I control it and how do I use it? Straightness is the symbol found in *figure 4*. Note the symbol is in a feature control frame with a corresponding value of straightness the cylinder must conform to. This form of straightness is **Surface straightness**.

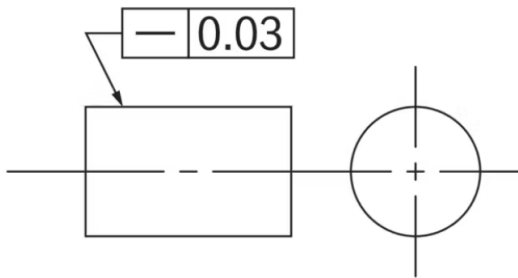


Figure 4 – Surface Straightness.

To use this straightness must be called out with a leader line pointing to the surface of a part. Straightness being a form control can't reference a datum. It is a uniform 2D control to ensure a part is uniform across a surface. If you imagined the cylinder in figure 4 that had a boundary line 0.03mm apart and split equally over the surface this is the boundary that the surface must fall in to conform to the drawing GD&T. The tolerance for surface straightness must be less than the dimensional tolerance on a dimension.

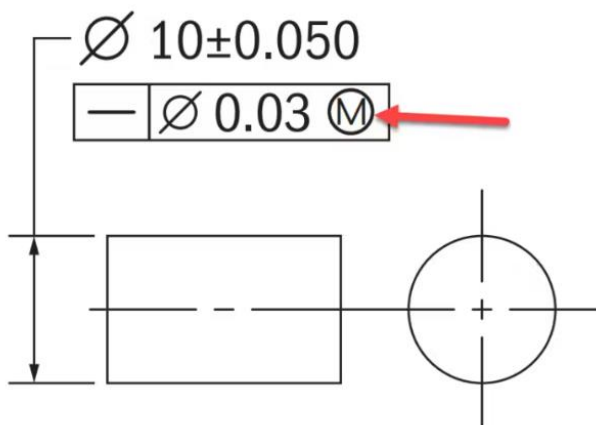


Figure 5 – Derived Median Line Straightness

Surface straightness can be referred to as "**Derived Median Line Straightness**" Figure 5. This form will control the bend of a central axis of a part. This is a 3D constraint that can use a Maximum material modifier. Notice in Figure 5 that the feature control is now underneath the diameter call out and has the added Modifier. The Modifier is of course optional!

# What is GD&T

The above figures show how even for a simple surface straightness control its position on your drawing is critical to convey the correct control information. Nest it unintentionally under a diameter you're now controlling something different entirely. So, what does figure 5 mean and how would you at home measure it if you had to make 100 of these?

In figure 5 there is a lot going on. For instance, you have a the pin that is 10.00mm  $\pm$ 0.05mm with a surface straightness of 0.03mm with a maximum material modifier!

To check all 100 pins, you made you can construct a gauge cylinder to measure the pins derived median line. To calculate the ID of the gauge cylinder you would take the base 10.0mm diameter and add to it the Maximum material condition plus the straightness tolerance.

That would be 10.0mm + 0.05mm + 0.03mm = 10.08mm. Therefore if you pin slipped through the cyclinder gauge you know if you made your pin on the maximum tolerance size and it fel within the derived median line straightness that the pin would glide through your gauge. Leaving you with a controlled good to use loco part you can mass produce with confidance.

Surface straightness is commonly used on sealing surfaces and pins that must be installed in a bore with clearance. This is a great control for parts you know may bend during manufacture. Using straightness means on a pin you can have a wider diameter tolerance and you control straightness. Thus, making manufacture cheaper 😊

So, before we wrap up this article lets look at flatness quickly. Flatness being a form control just like straightness CAN'T be relative to a datum. Can you use Maximum material call outs, Sure can. Flatness is just the 3D form of straightness over a surface. Where could you use it? Say you had to set a flatness of the top of an engine cylinder. You could control the overall height of the cylinder really tight. But this may cause a lot of rejected parts. Or add flatness! Thus, your total thickness tolerance can be opened up but the flatness boundary above and below the surface will control the final flatness.

A keen mathematician will note if you made the cylinder ON your maximum thickness tolerance the flatness would need to be perfect. This is where taking a few steps back and making sure your dimensional tolerances with GD&T make sense and are achievable. See figure 6 for what the symbol may look like on a drawing. And just like straightness. If you nest surface flatness underneath a parts width dimension it will now control the Derived median plane. All the same rules then apply. You will find in GD&T a lot of 2D symbols then have the same rules in their 3D form.

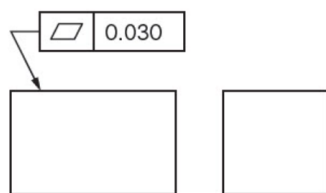


Figure 6A



# What is GD&T

Figure 7 is what a surface flatness call out on a surface width measurement would look like. Not it has a modifier and is nested directly under the width measurement. Again, to make a gauge to measure this flatness. You can construct two parallel plates where the gap is the maximum thickness tolerance with the surface tolerance added just like our previous pin example. Gauges like these are termed "Functional Gauges". I hope this helps you draw better parts. Next month we will look at the last two form controls: Circularity and Cylindricity and we may even sneak in an orientation control like Parallelism.

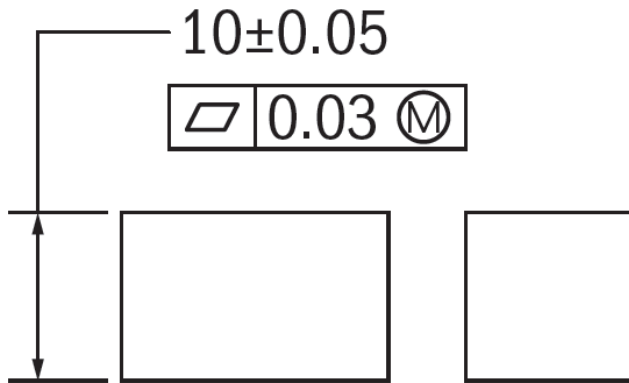


Figure 7 – Flatness of a surface with material modifier

Cameron Billiau

# Sales and Wanted to Buy

*For Sale:*

## Passenger Bogies:

**Description:** Pair of bogies for a 7 1/2" gauge rail. Both are ground level trollies with a hand operated brake on both. The red rocket is 2m long with plush grey interior seating. The sportier mellow yellow bogie is a cosy 1.14m long sporting black seating.

**Price:** Make a Reasonable Offer

Contact: Greville Wills (09) 411 5092 or [gandj@actrix.co.nz](mailto:gandj@actrix.co.nz)

## Photos:



## *Wanted*

Small Four jaw chuck for lathe. Prefer plain back. Will take anything

**Contact:** Cameron Billiau 02041662227