Revolution Update

ASTT Conference 2025 - Darlington

Revolution Progress

- Tender Build
- Valve Gear and Motion
- Cylinders
- Cab
- Boiler
- The Greatest Gathering
- Next Steps

Tender Build

- Wheels and Axles
- Bogie Assembly
- Hand Brake
- Chassis Fabrication
- Tender Tank / Covers / Baffles
- Tender Drawgear

Tender Wheels – milled from solid

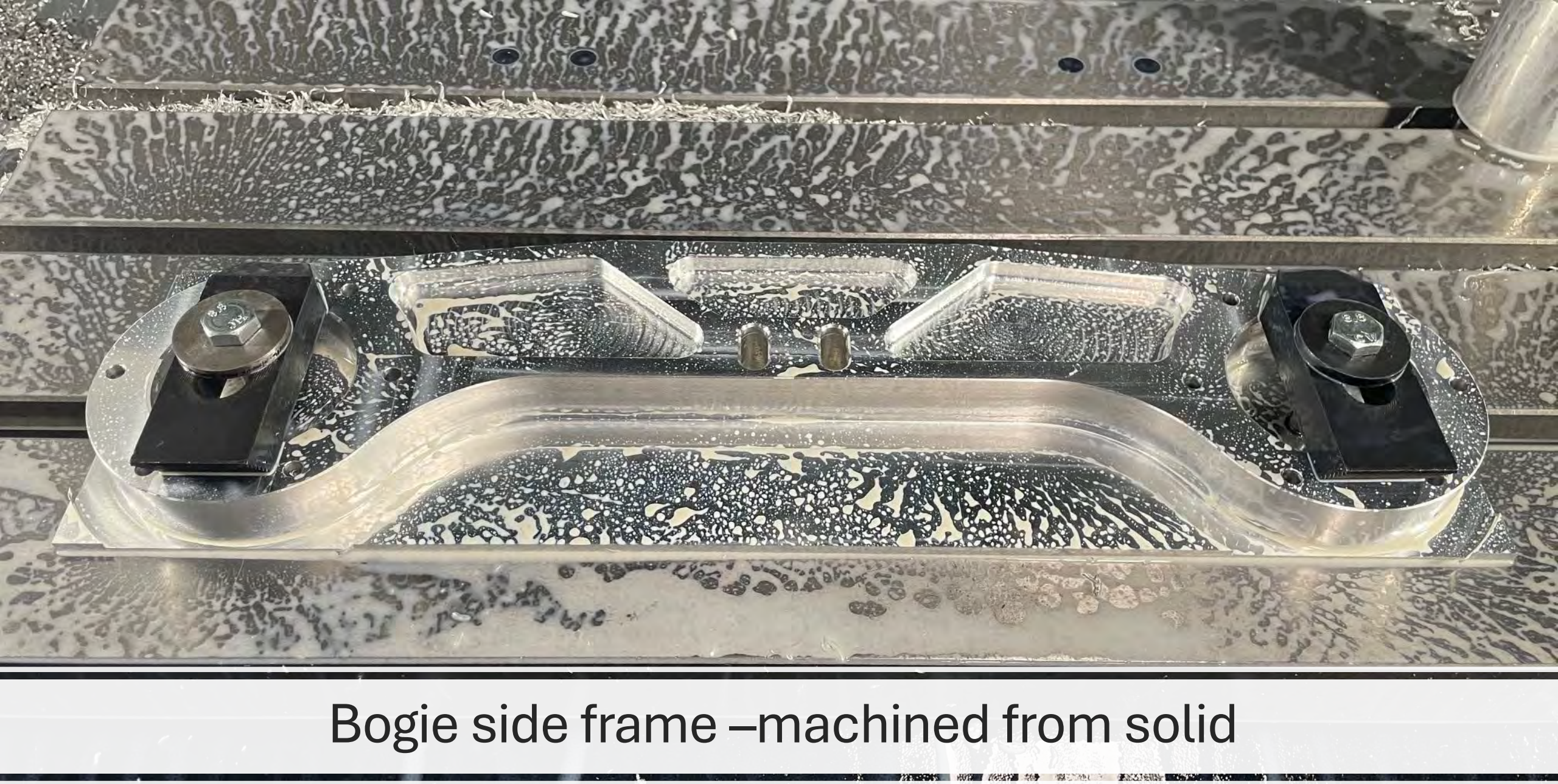
Wheel profile

Tender wheels after first op.

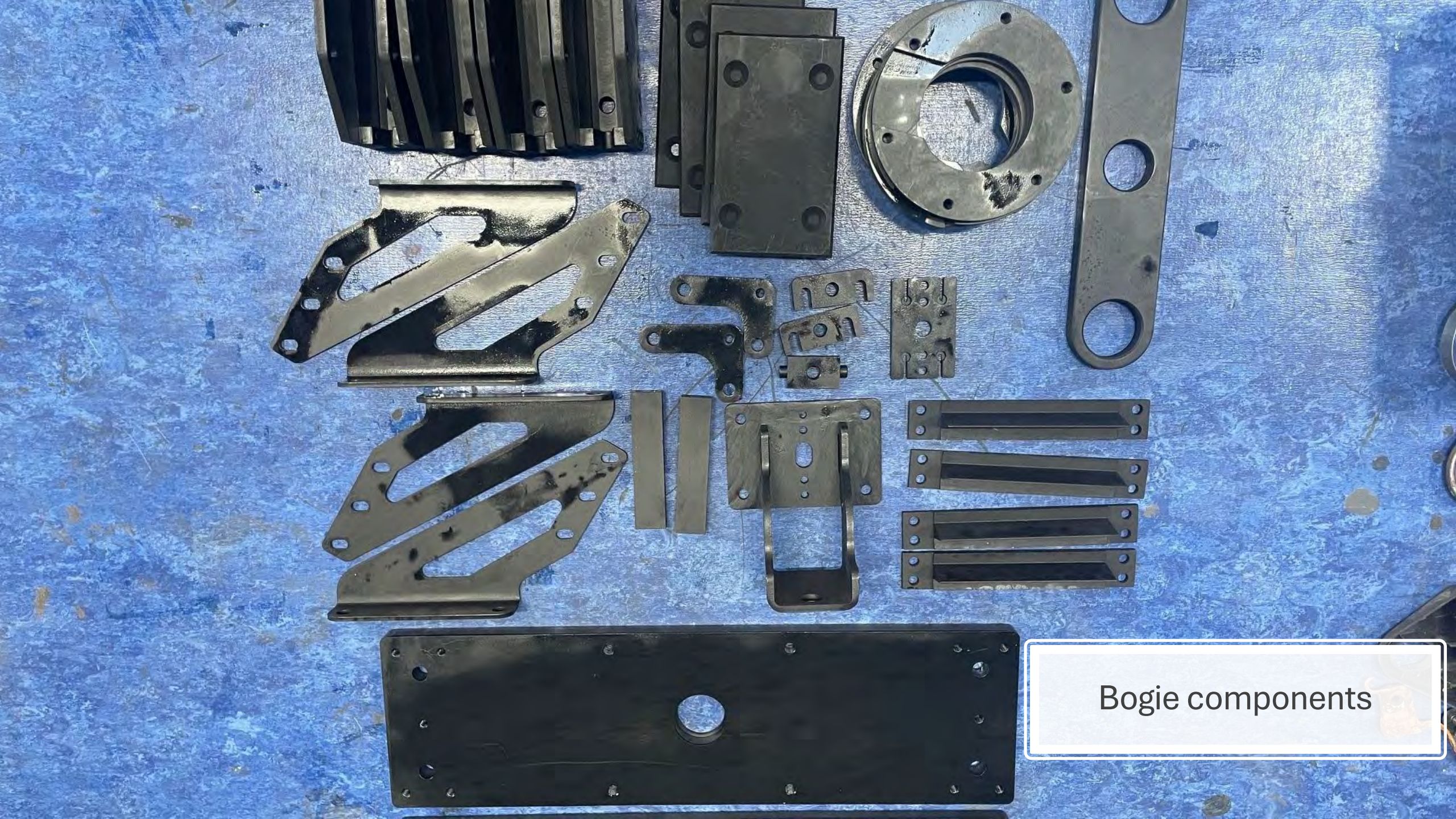
Tender axles turned between centres – John Dunn

Axlebox components

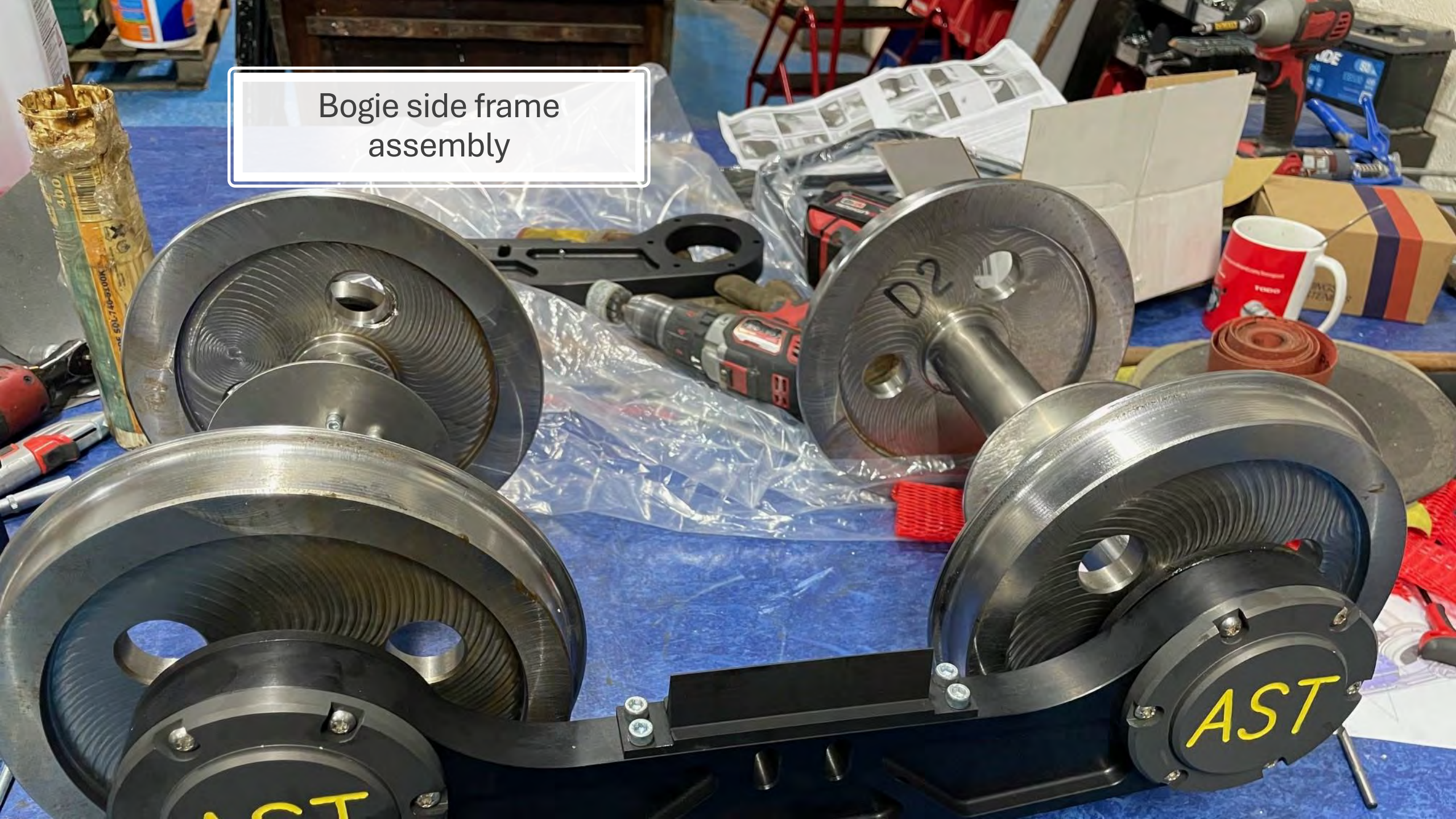
Axle assembly



Bogie side frame –machined from solid



Bogie components


Bogie side frame
assembly
D2
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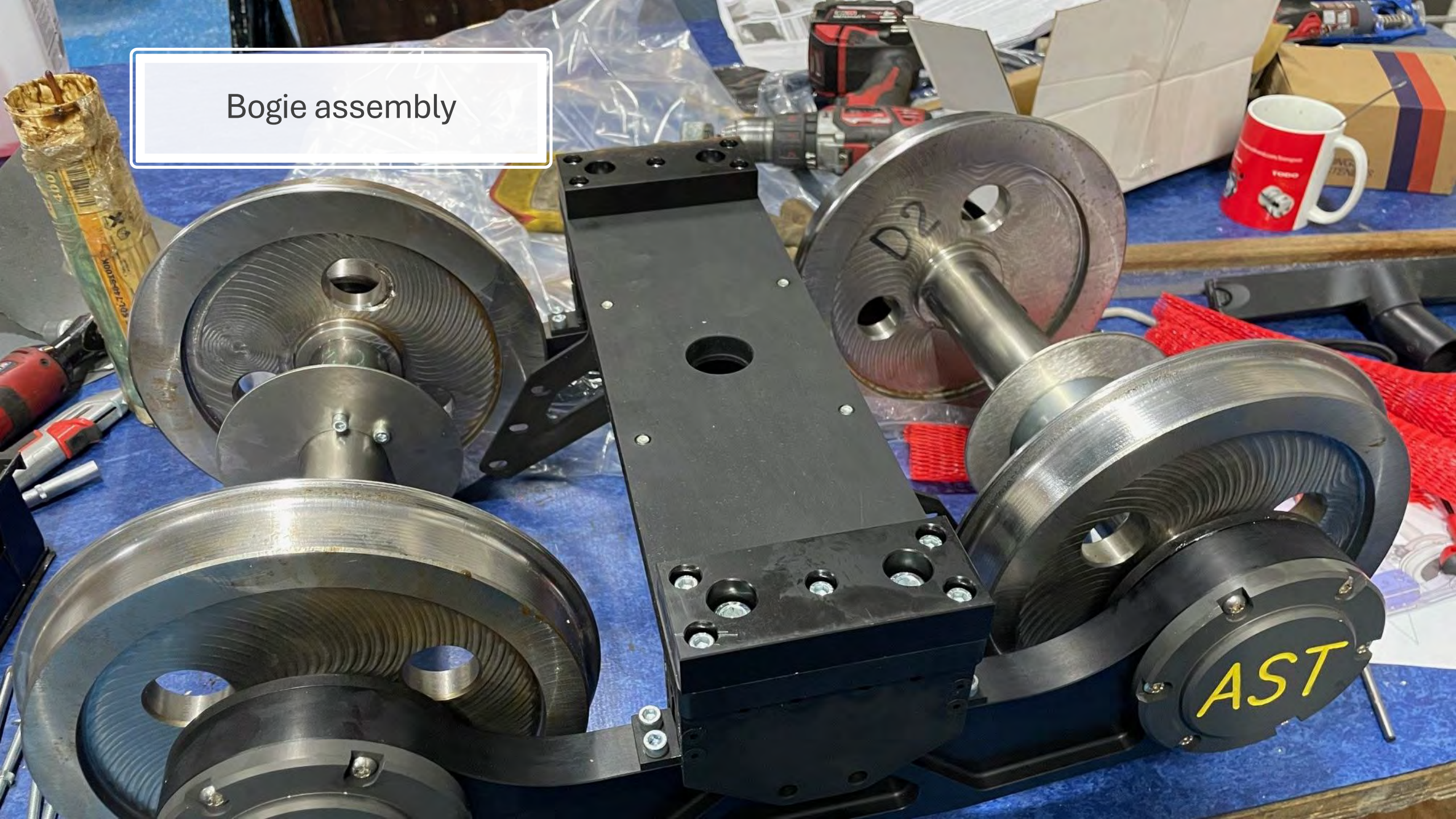
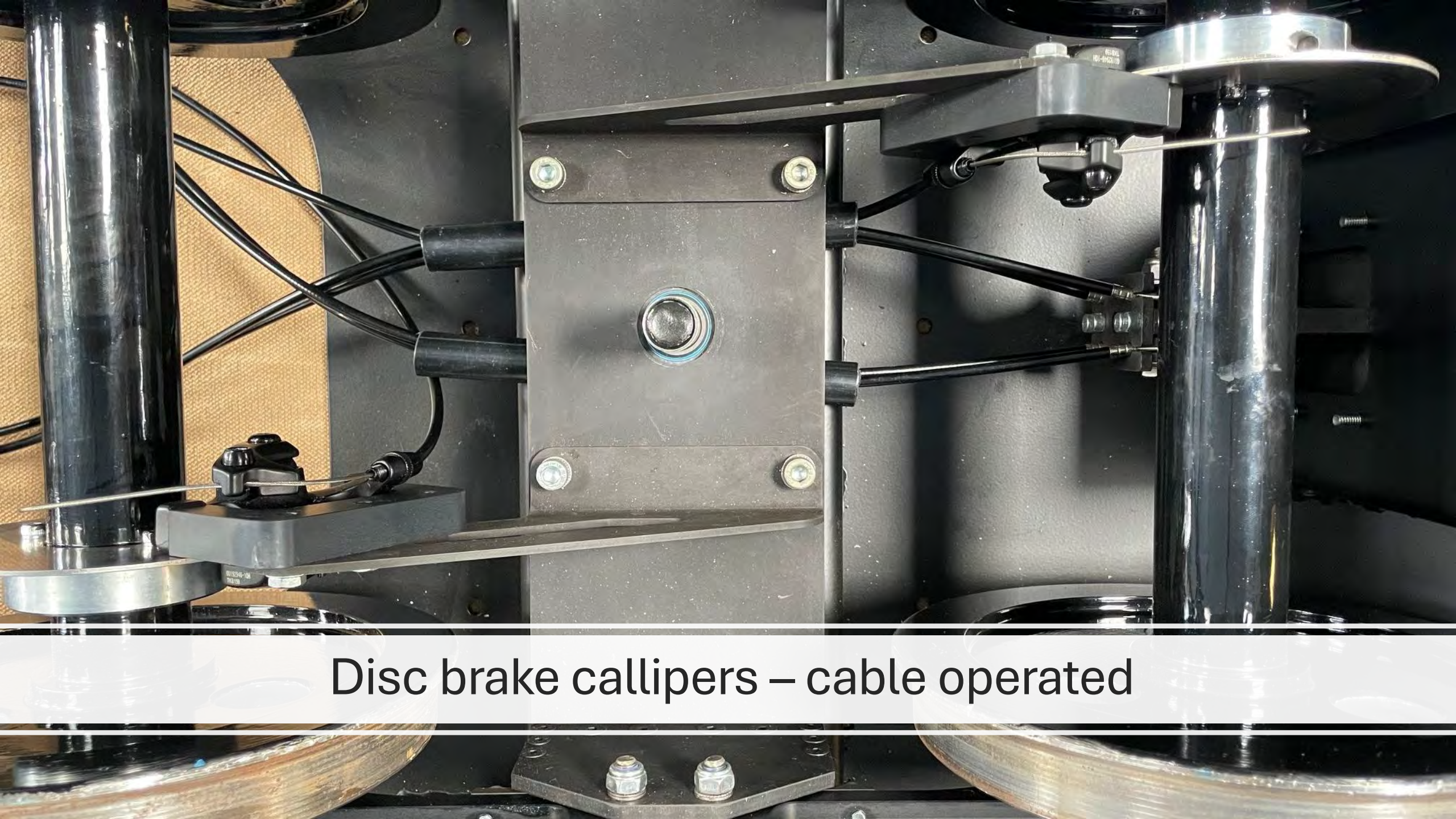
Bogie assembly



Handbrake assembly

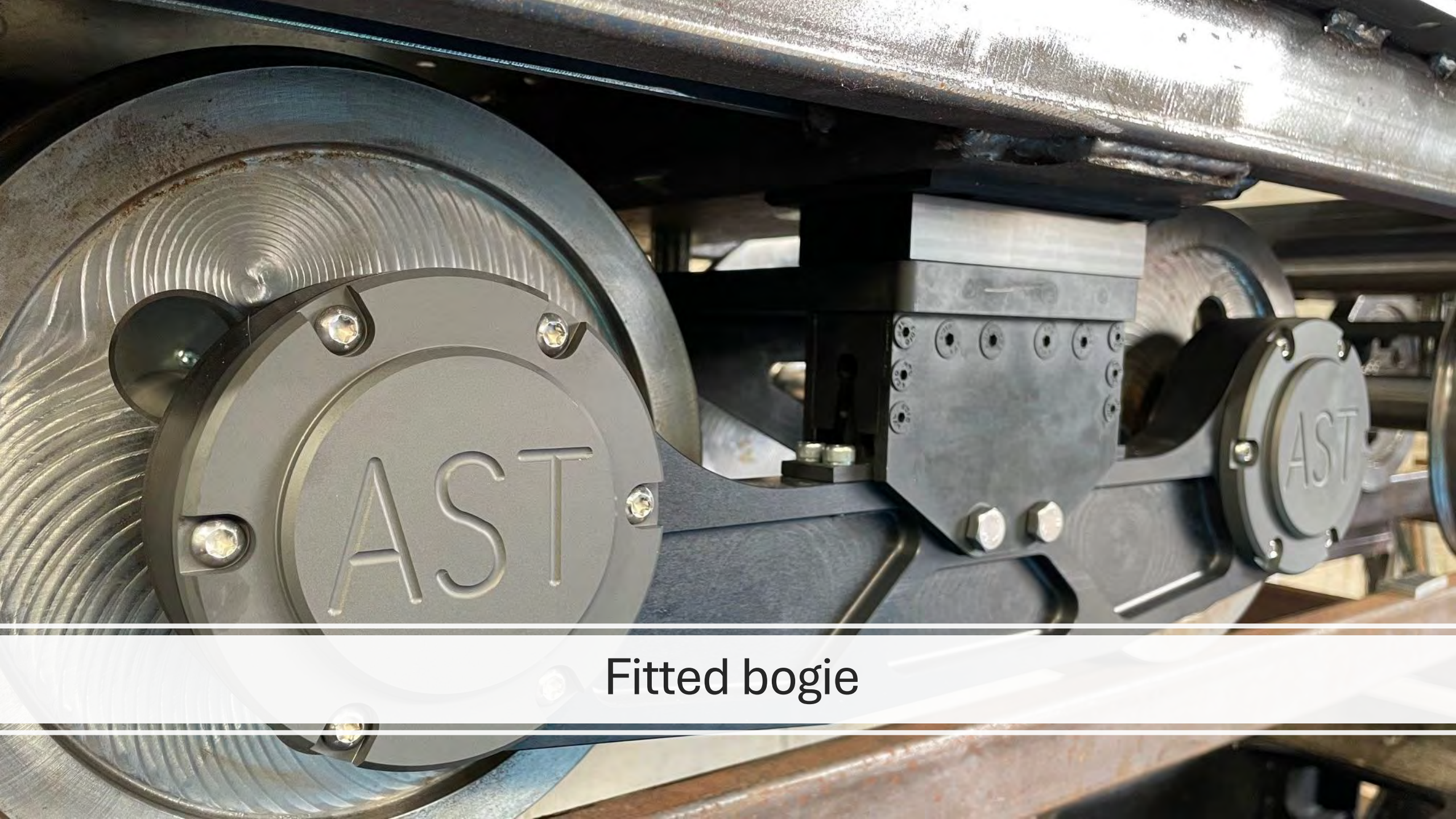
Disc brake callipers – cable operated



Disc brake callipers – cable operated

Tender chassis fabrication

Tender chassis fabrication



Fitted bogie

Chassis assembly

Chassis Assembly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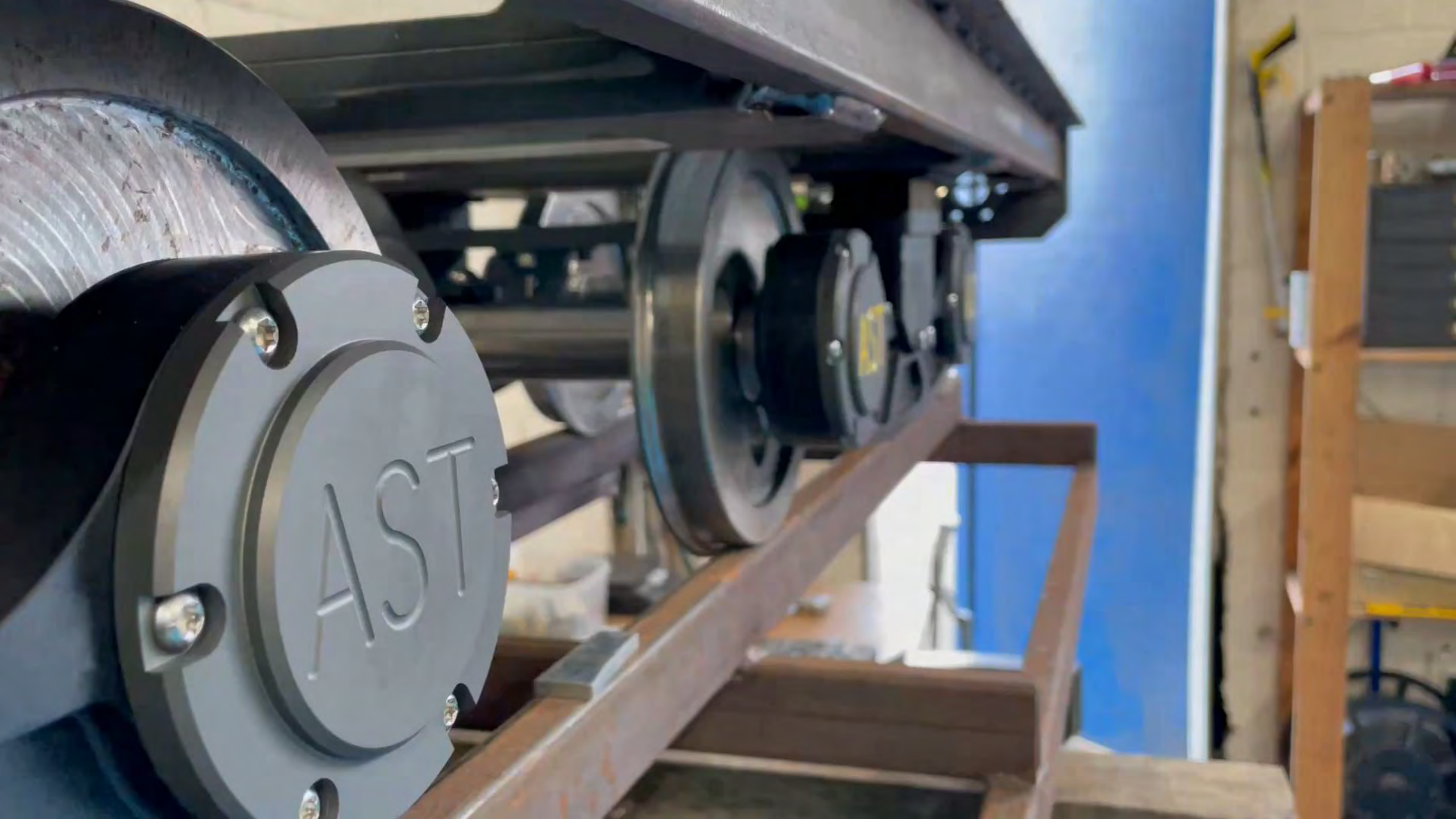
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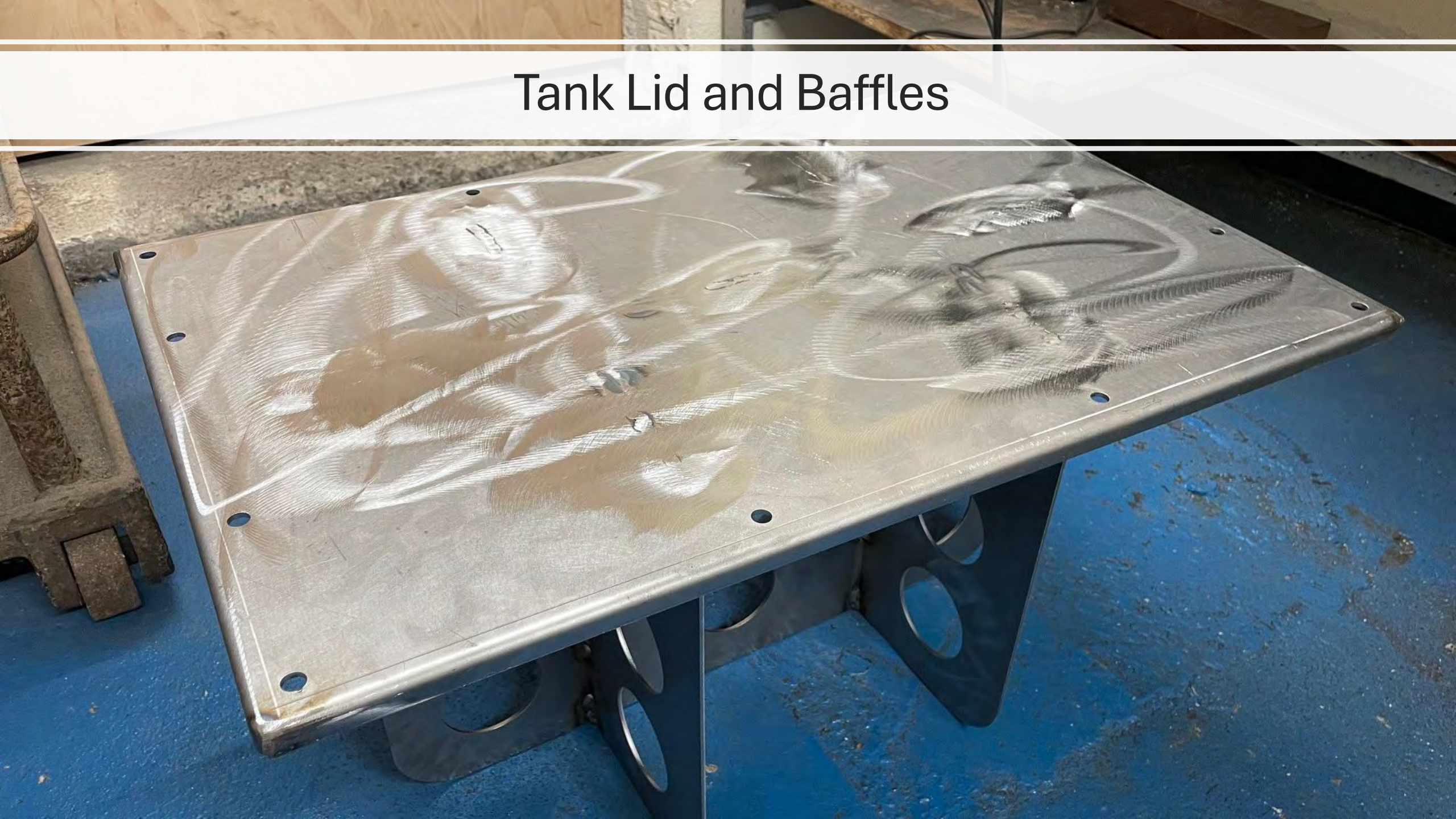
Tender Tank Fabrication

Tank Lid and Baffles



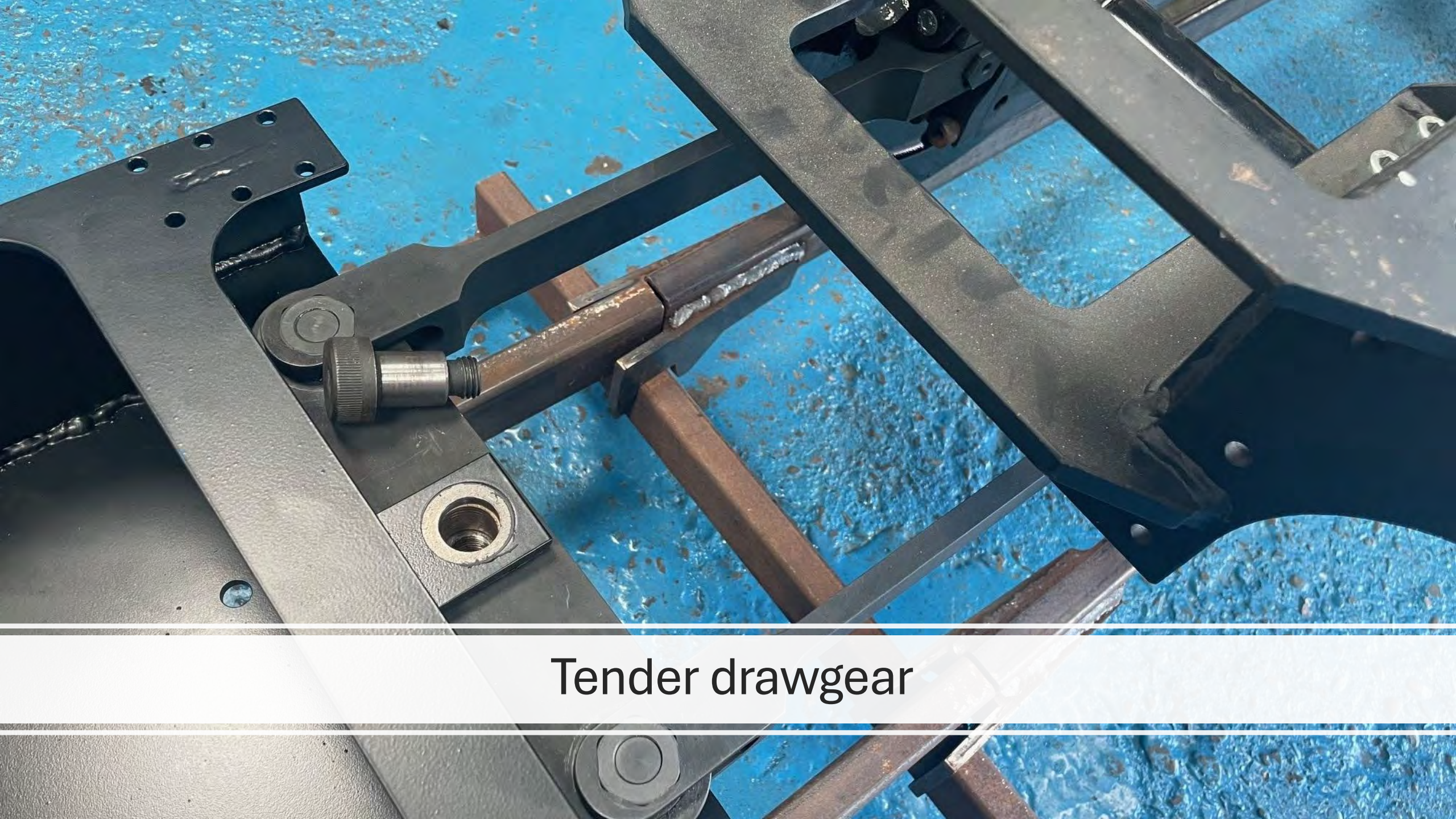
Tank Filler Lid

Tank sand blasted and primed

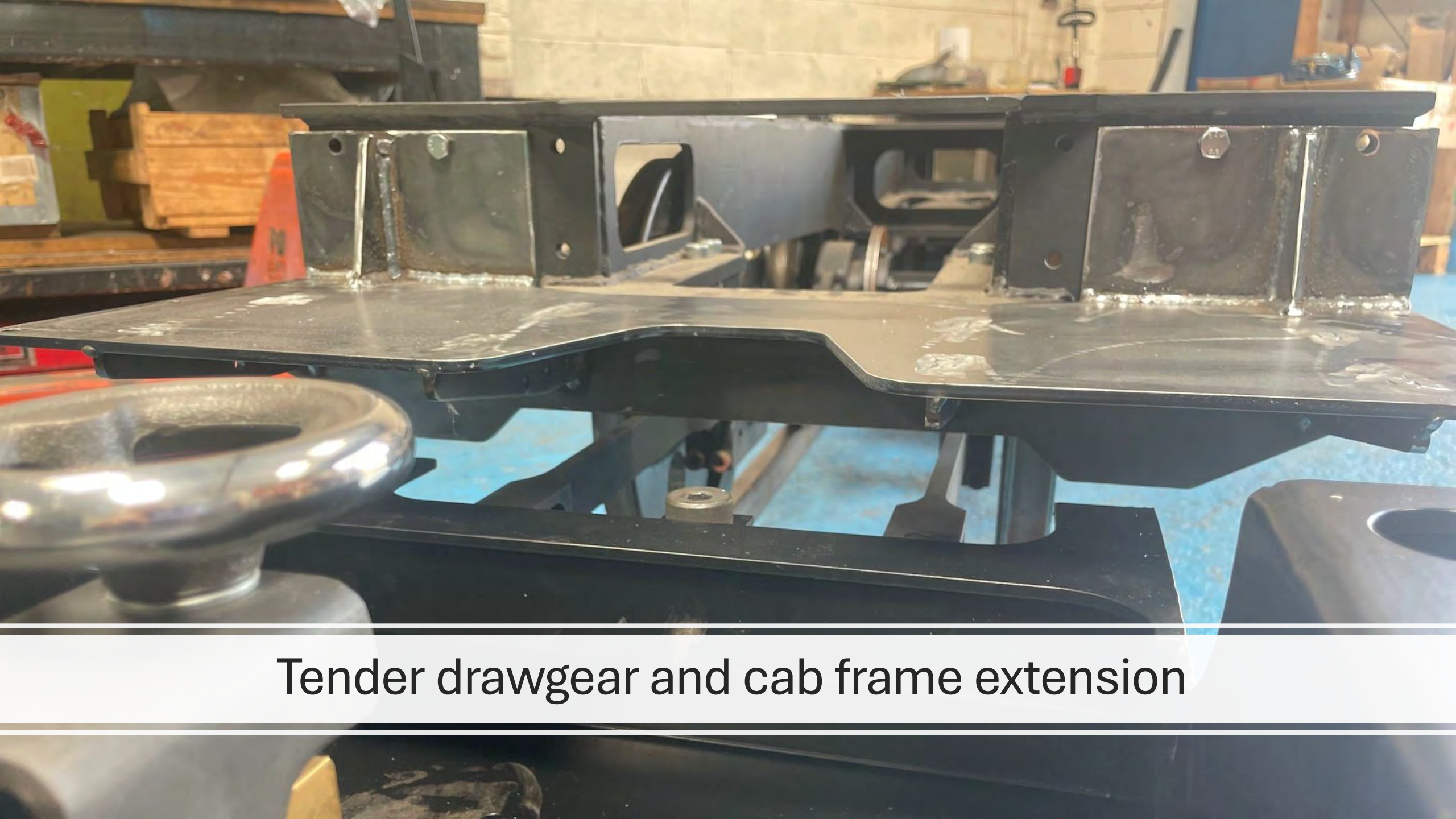
Cab Side Doors

(Nearly) Finished Tender

Tender drawgear



Tender drawgear



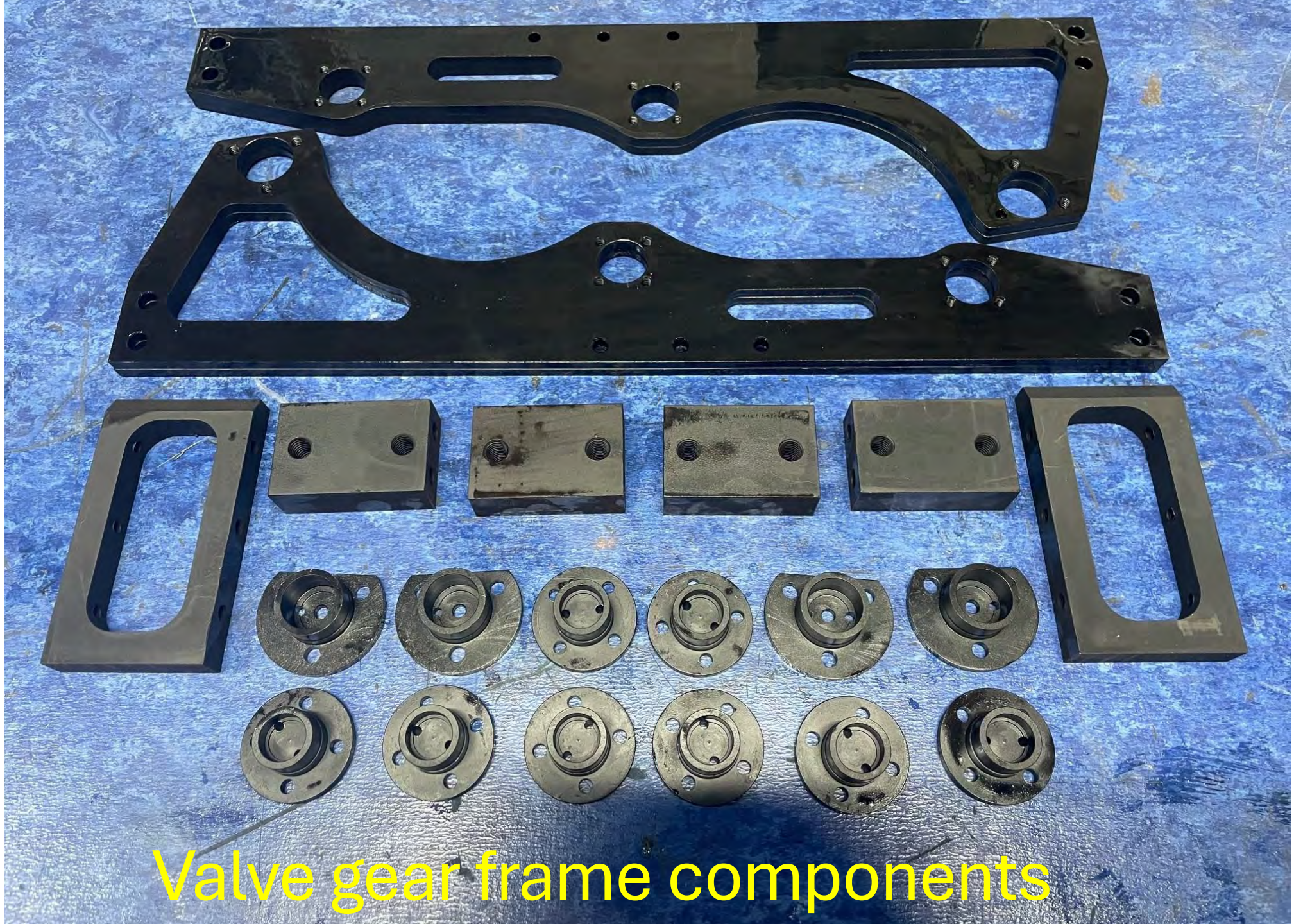
Tender drawgear and cab frame extension

Valve Gear and Motion

- Roller Guide Bars
- Gear Frame
- Valve Gear Components

Roller guide bar bits – Tufftride finish

Assembled con-rod and guide bar



Valve gear frame components

Assembled valve Gear Frame

Assembled valve Gear

Assembled valve Gear

?

Return Crank

Cylinders

- Cylinder and Valve Bores
- Liners
- Cladding
- Valve Drive Components

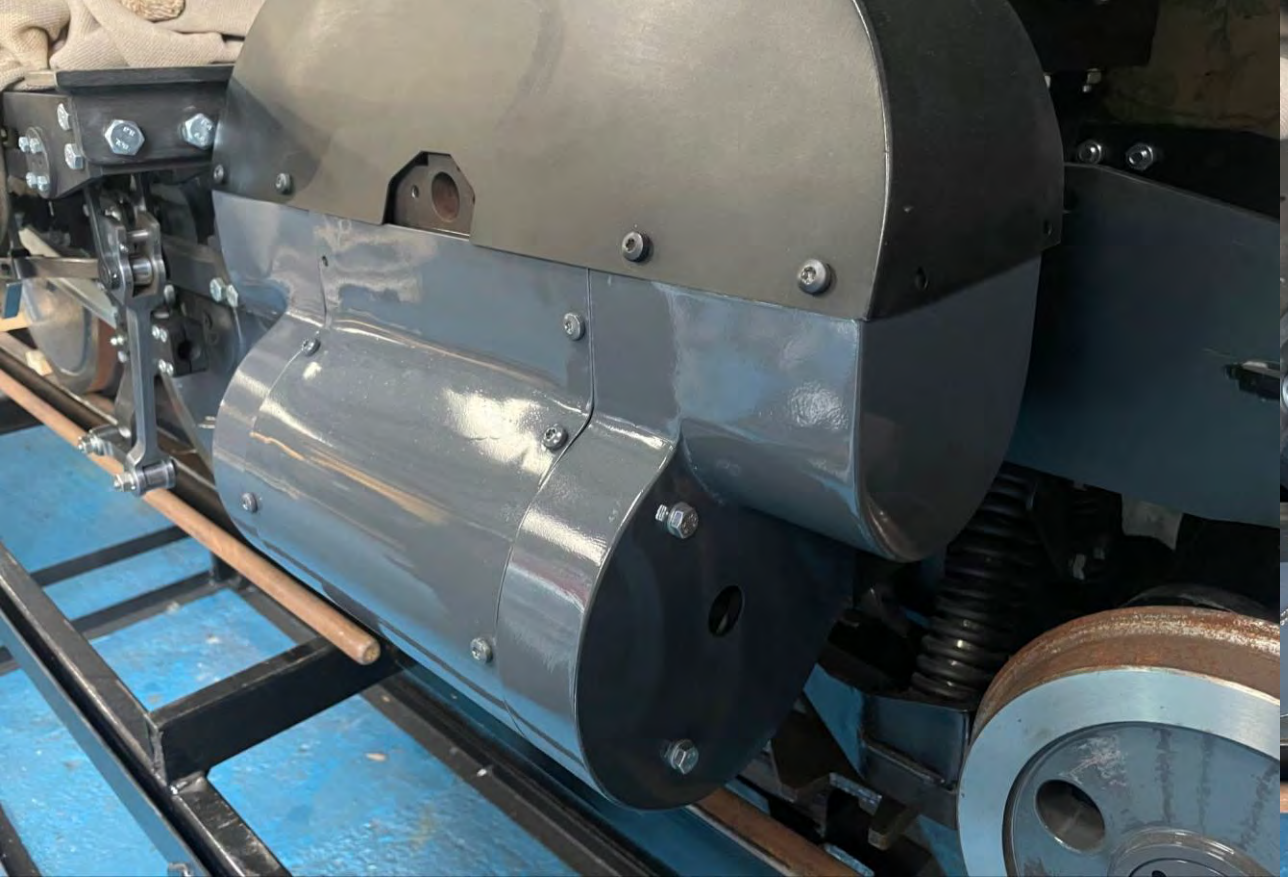
Cylinders finish machined

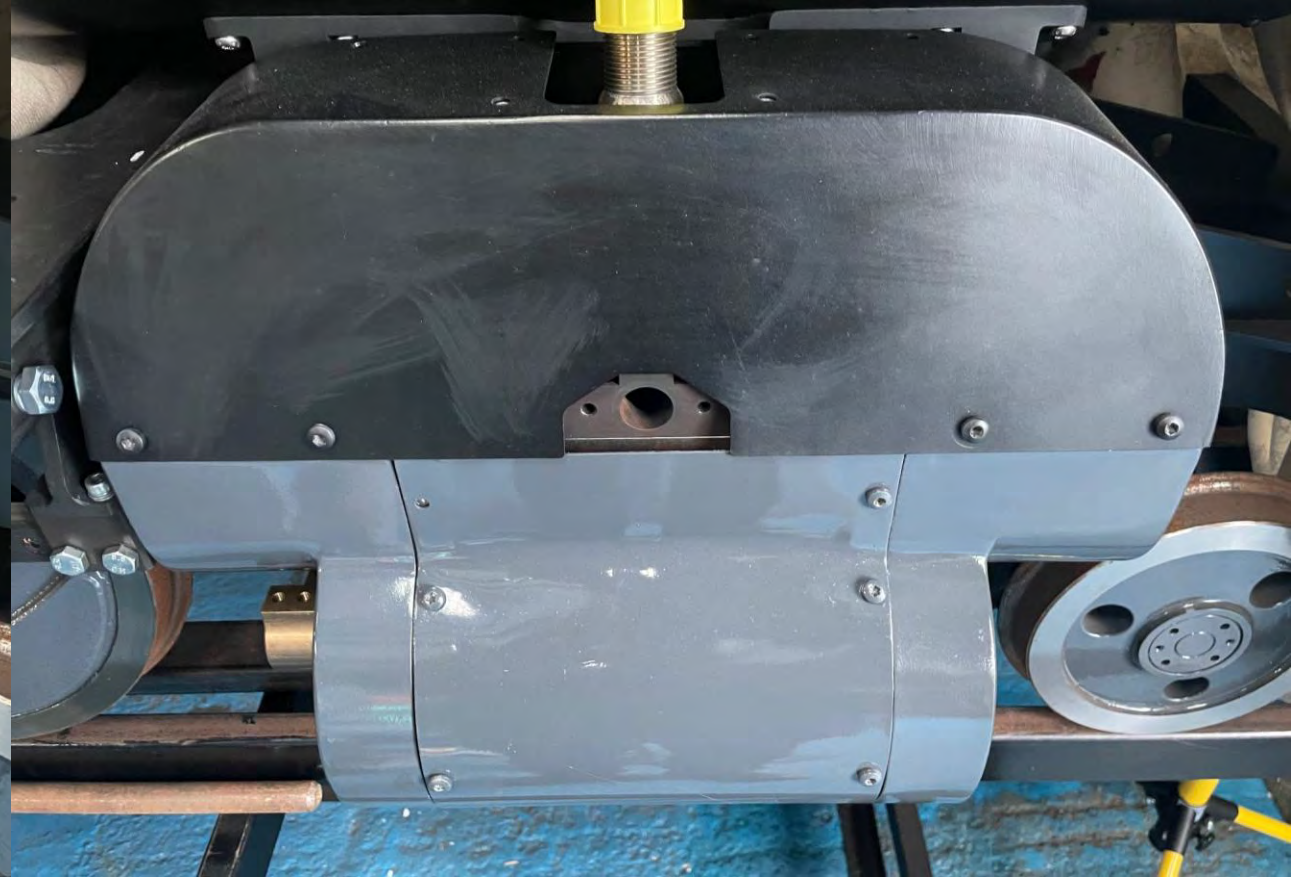
Cylinder bores

Cylinder Liners

Steam Pipes

Cylinder Cladding components





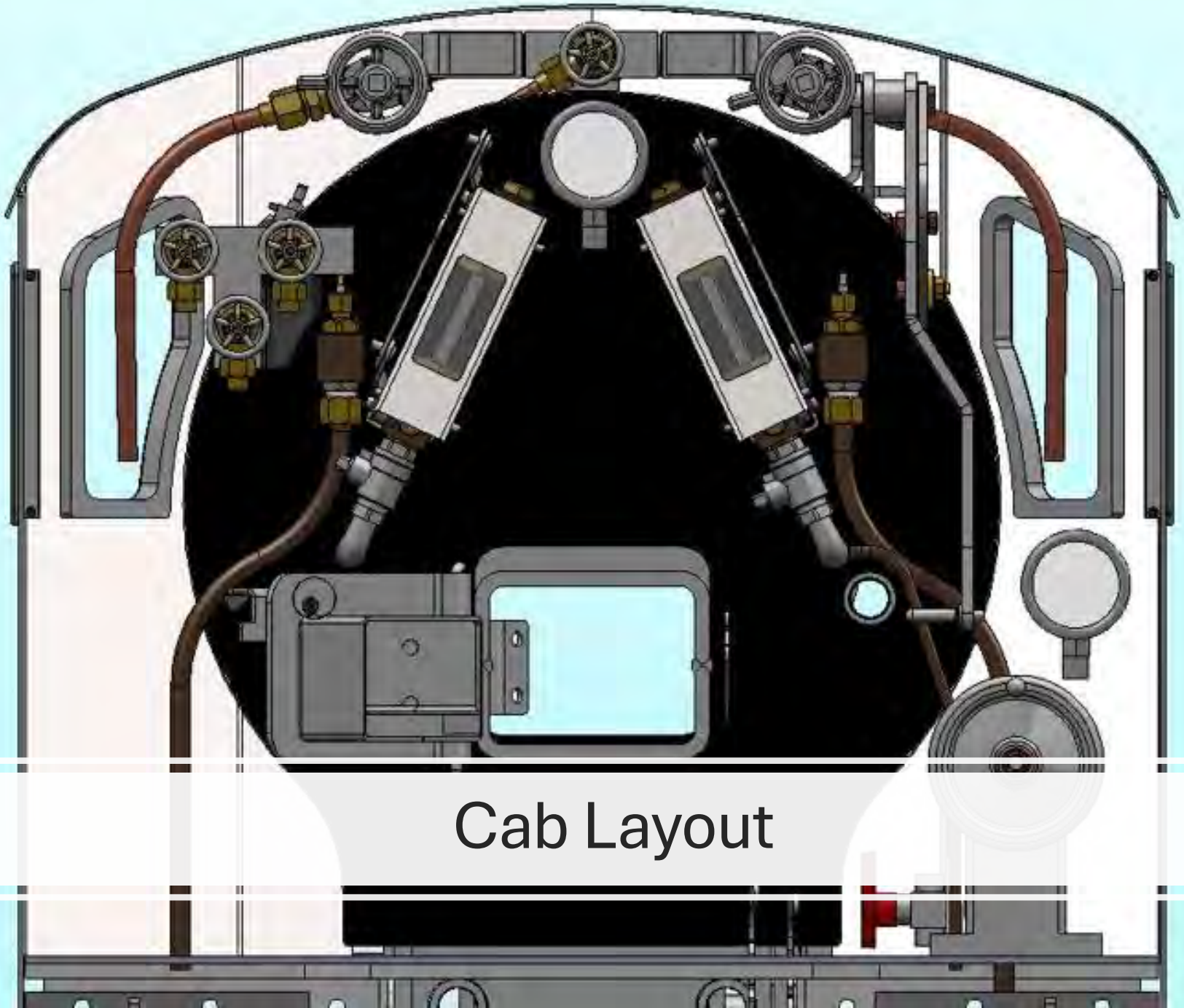
Cylinder Cladding

Outer Lever – Valve Rocker Shaft

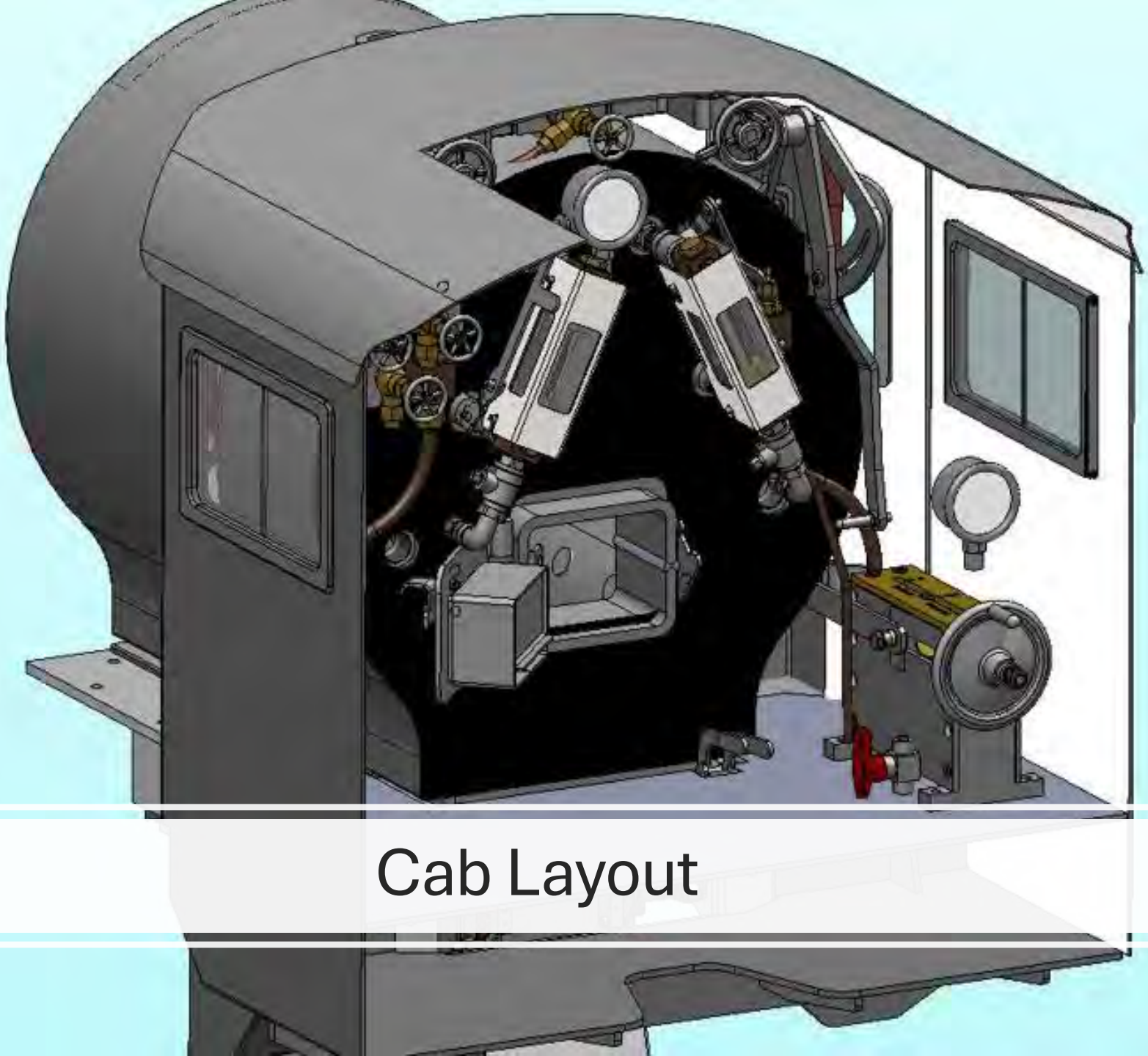
Valve gear rocker covers,
Rocker bearing supports,
Rocker mounting plates

Cab

- Layout
- Reverser Gear



Cab Layout



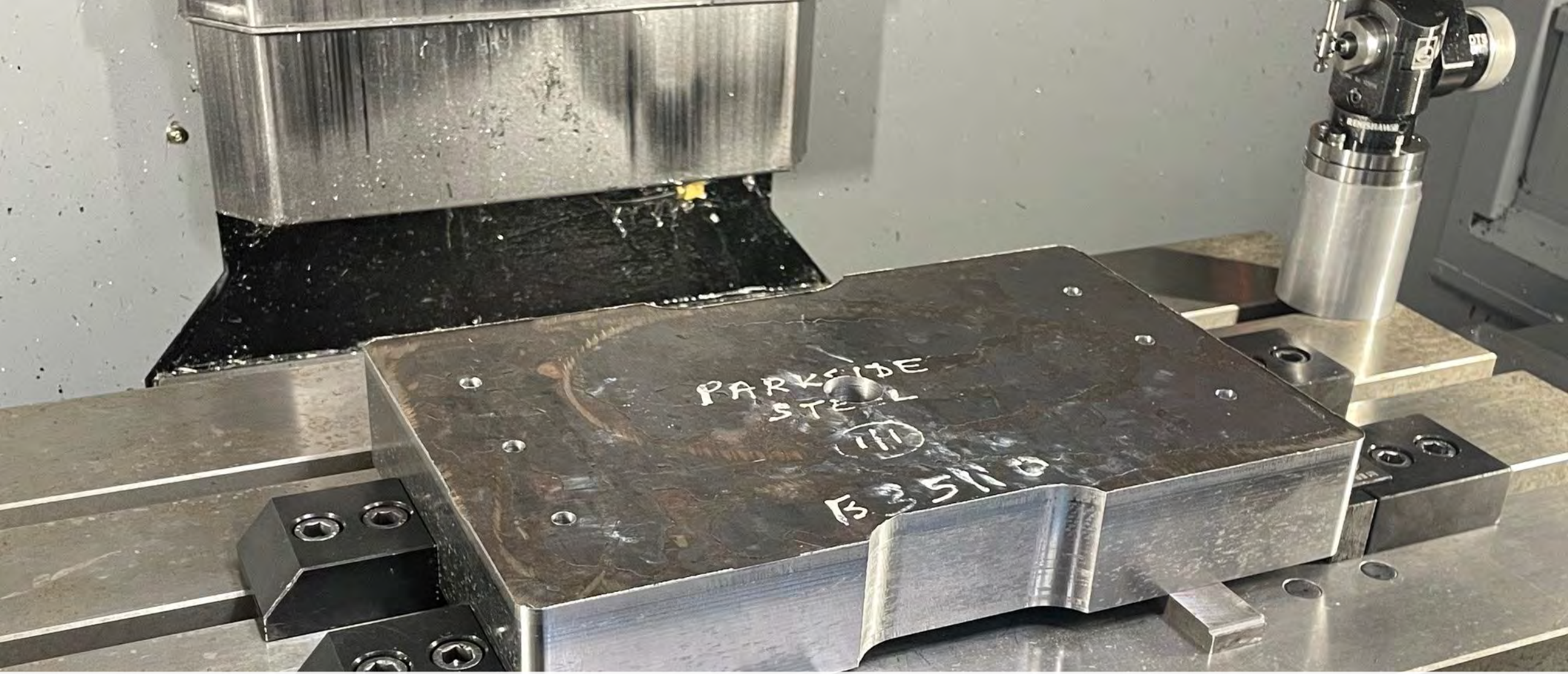
Cab Layout

Reverser Pedestal components

Reverser Pedestal components

Boiler

- Smokebox
- Design Tweaks



Smokebox Saddle

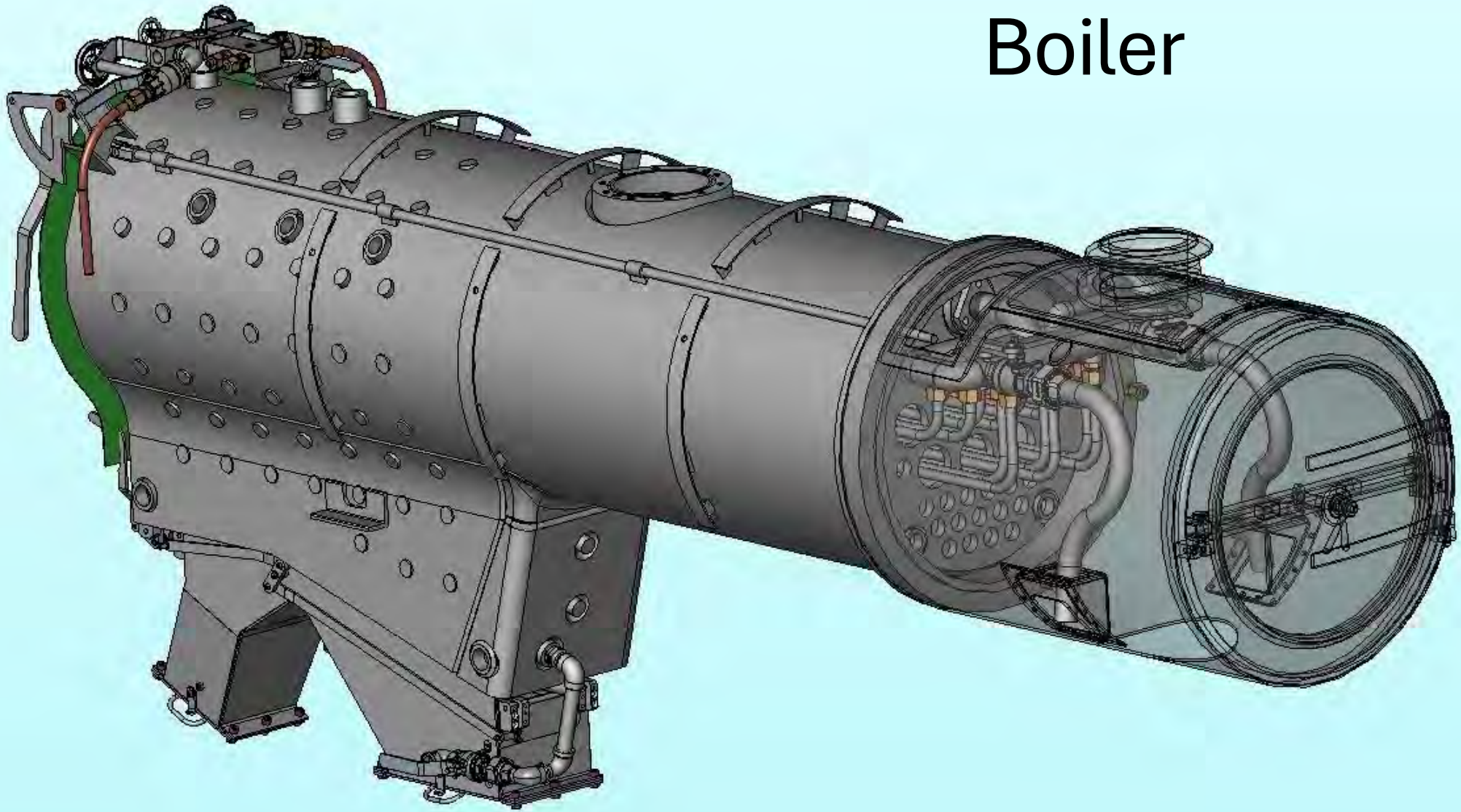
Smokebox Saddle

Smokebox Saddle

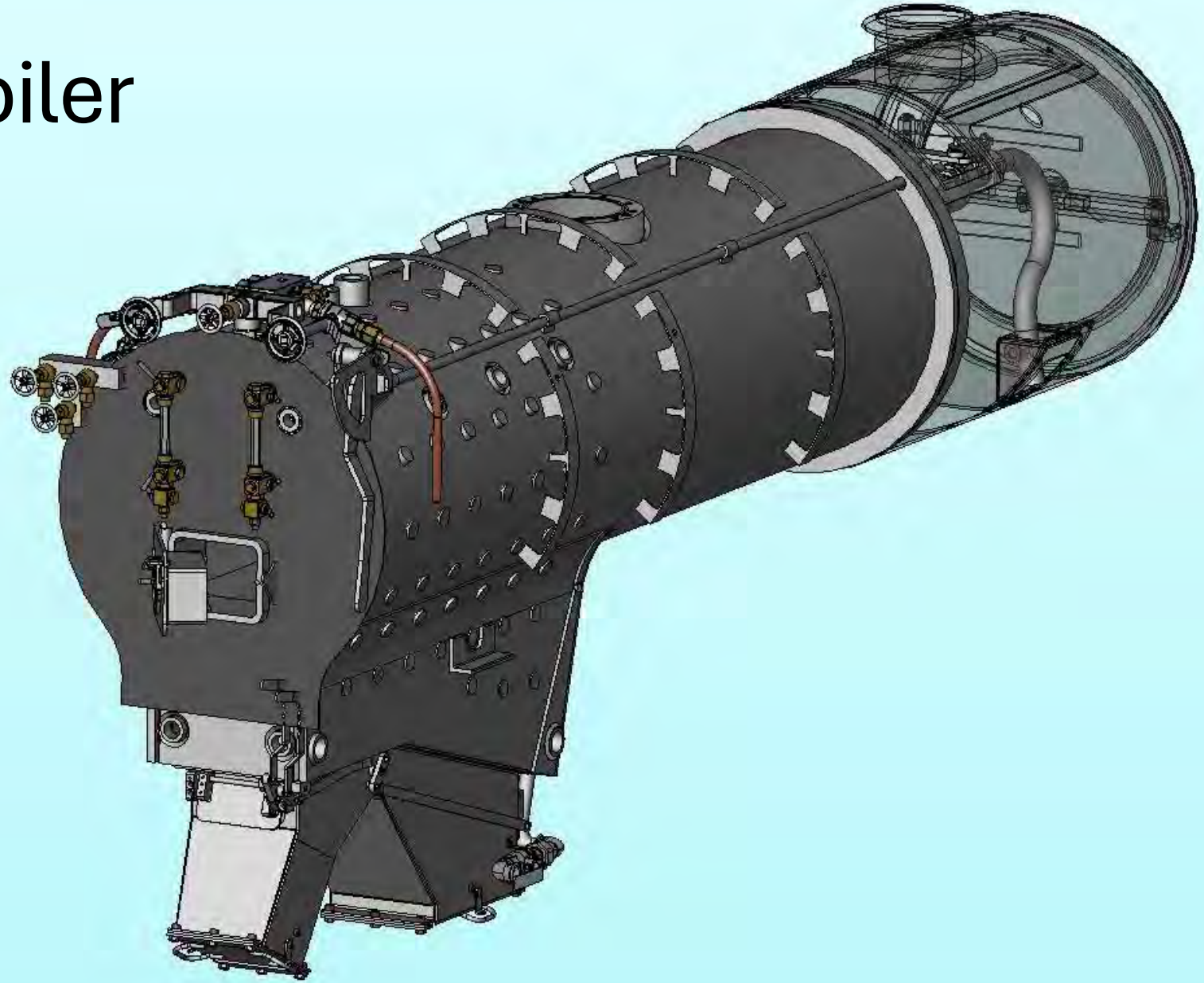
Smokebox Shell

Smokebox Shell

Boiler



Boiler



BOILER INTERNAL DIMENSIONS

FIREBOX

GRATE WIDTH	**120.2**	mm
GRATE LENGTH	**536.0**	mm
FIREBOX WALL AREA	**0.72000**	m^2
FIREBOX VOLUME		M^3
HEIGHT GRATE TO FIREBOX CROWN	**362.5**	mm
AVERAGE WALL THICKNESS	**10.0**	mm
WALL THERMAL CONDUCTIVITY	**48.0**	Watts/m/Deg. C

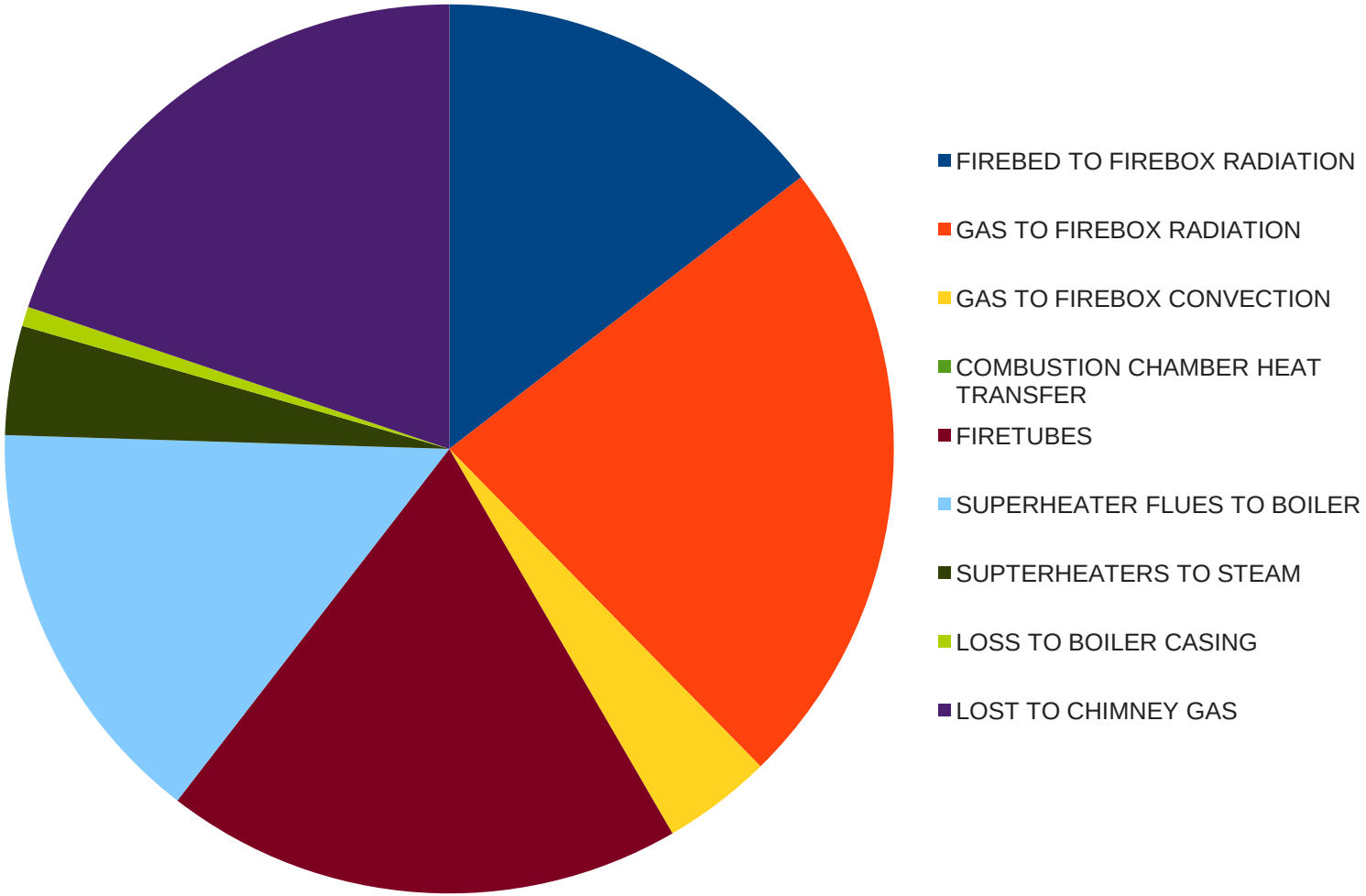
COMBUSTION CHAMBER DETAILS

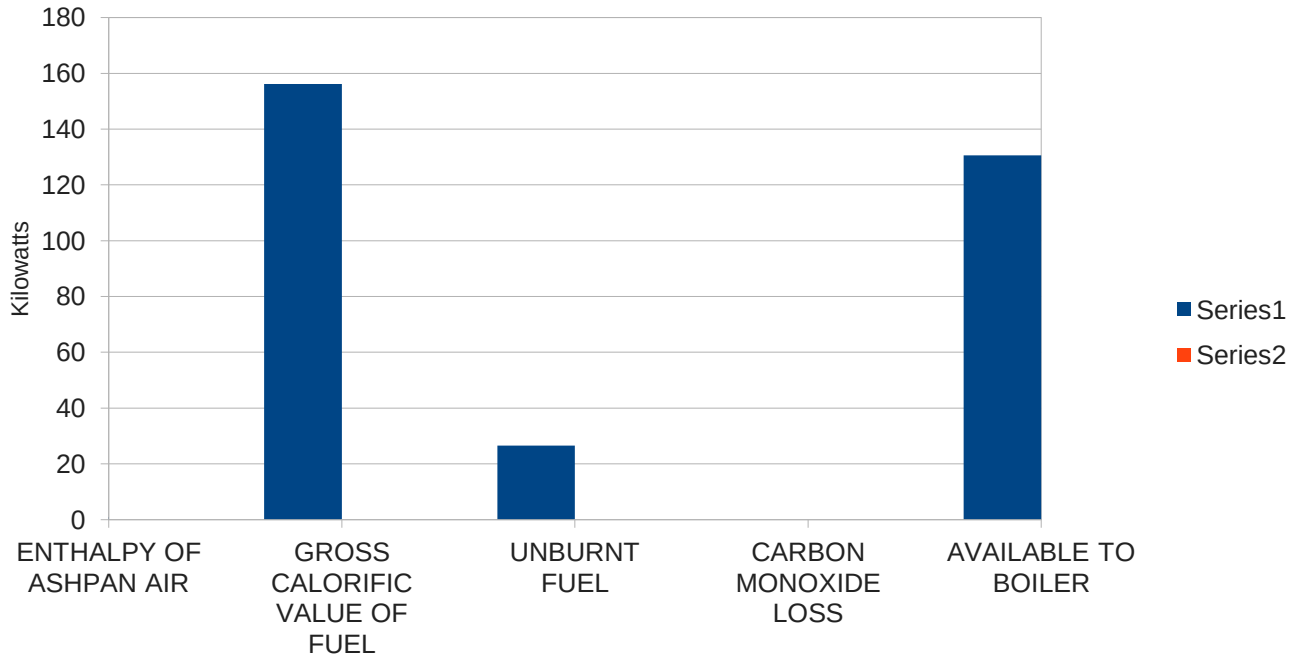
COMB. CHAMBER CROSS SECTION (GAS) AREA	**0.1**	mm^2
COMB. CHAMBER PERIMETER	**1312.4**	mm
COMB. CHAMBER WALL AREA	**0.0**	m^2

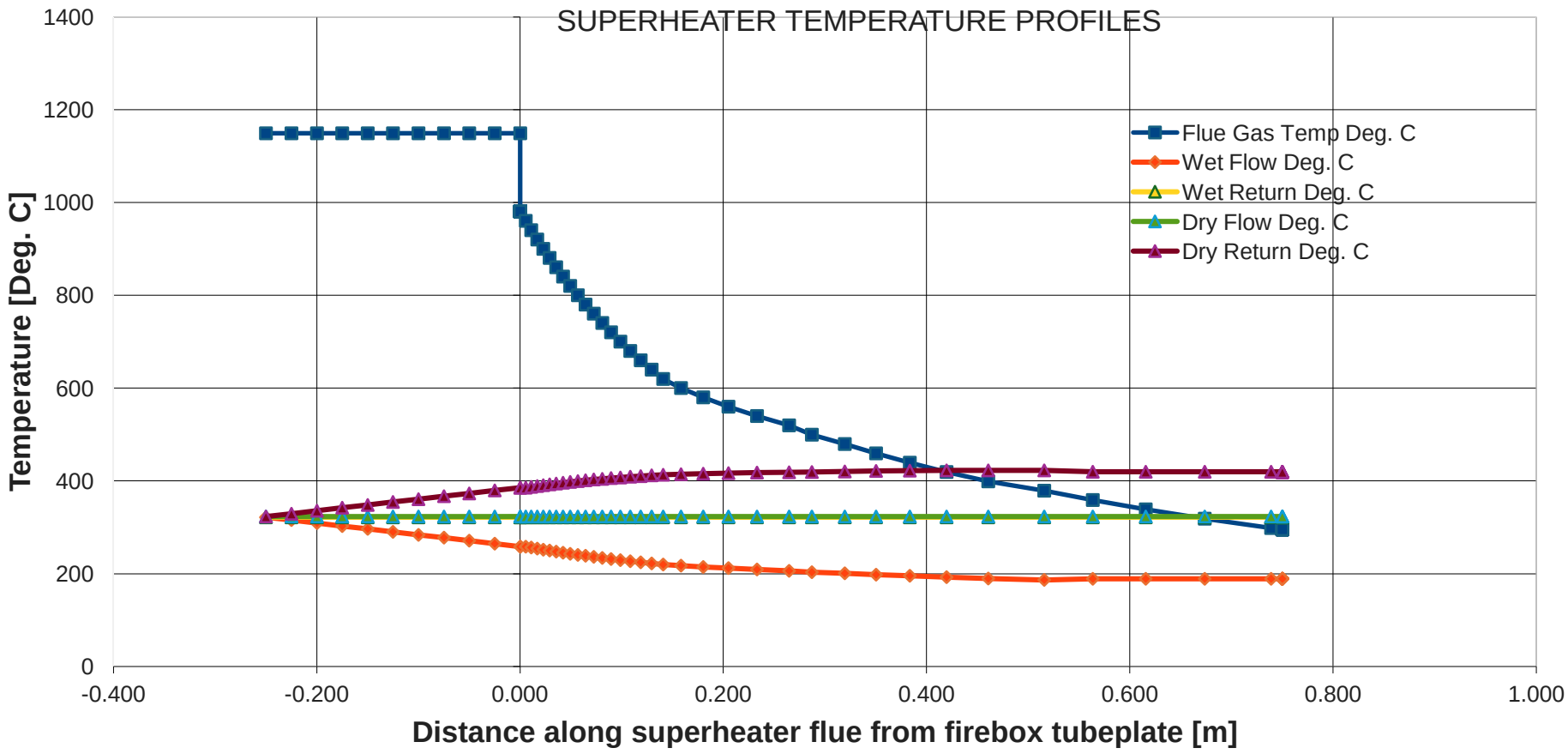
TUBE BANK DETAILS

LENGTH TUBEPLATE - TUBEPLATE	**0.750**	m
SMOKE TUBE DETAILS		
INT. DIA. OF SWAGED SECTION / FERRULE	**17.46**	mm
POSITION OF SWAGE	**0.00**	mm
INTERNAL DIAMETER OF MAIN SECTION	**17.46**	mm
NUMBER OF FIRETUBES	**17**	
SUPERHEATER FLUE DETAILS		
INT. DIA. OF 1ST SWAGED SECTION	**39.17**	mm
POSITION OF 1ST SWAGE	**0.00**	mm
INT. DIA. OF 2ND SWAGED SECTION	**39.17**	mm
POSITION OF 2ND SWAGE	**0.00**	mm
INT. DIA. OF MAIN SECTION	**39.17**	mm
NUMBER OF S/HEATER FLUES	**5**	
No. OF ELEMENTS PER FLUE	**2**	
TYPE OF SUPERHEATER	**2**	
OUTSIDE DIA. OF S/H ELEMENT	**12.00**	mm
INSIDE DIA. OF S/H ELEMENT	**9.00**	mm
RADIANT LENGTH	**250**	mm

5 Flues 39.17id with 10 elements 12od x 9id with 250 radiant length				
PREDICTED PERFORMANCE				
COMBUSTION GAS FLOW	6.132E-02	kg/s	486.2	lb/hr
CO2 GAS READING	13.42	%		
TOTAL DRAUGHT	84.21	mm H2O	3.32	Ins H2O
TUBE BANK RESISTANCE (TOTAL)	34.95	mm H2O	1.38	Ins H2O
TOTAL HEAT IN FUEL	156.187	kW		
HEAT RELEASE RATE	129.641	Kw	4.4236E+05	BTU/hour
GRATE EFFICIENCY	83.00	%		
MAX. TEMP IN FIREBOX	1459.2	Deg. C	2659	Deg. F
INLET TEMP TO FLUES & TUBES	1015	Deg. C	1859	Deg. F
EXIT TEMP FROM FIRETUBES	406	Deg. C	764	Deg. F
EXIT TEMP FROM SUPERHEATER FLUES	296	Deg. C	564	Deg. F
AVERAGE SMOKEBOX TEMPERATURE	356	Deg. C	672	Deg. F
EVAPORATION RATE	3.571E-02	kg/s	283.1	lb/hr
EVAPORATION RATIO	8.067			
ENERGY IN STEAM PRODUCED	109.122	kW		
HEAT TRANSFER EFFICIENCY	84.17	%		
OVERALL EFFICIENCY	69.87	%		
SUPERHEATED STEAM TEMPERATURE	420	Deg. C	787	Deg. F
SUPERHEAT	222	Deg. C	399	Deg. F
SUPERHEAT STEAM VELOCITY (MIN)	9.11	m/s	29.87	Ft/s
SUPERHEAT STEAM VELOCITY (MAX)	14.69	m/s	48.20	Ft/s
SUPERHEAT PRESSURE DROP	7026	Pa	1.03	PSI
STEAM VOLUME	9.422E-03	m3/second	574.99	Cubic inch/s
AVAILABLE VOLUME FOR POWER	9.221E-03	m3/second	562.69	Cubic inch/s


FIREBED TO FIREBOX RADIATION
GAS TO FIREBOX RADIATION
GAS TO FIREBOX CONVECTION
COMBUSTION CHAMBER HEAT TRANSFER
FIRETUBES
SUPERHEATER FLUES TO BOILER
SUPTERHEATERS TO STEAM
LOSS TO BOILER CASING
LOST TO CHIMNEY GAS


180
160
140
120
100
80
60
40
20
0
Kilowatts
ENTHALPY OF ASHPAN AIR
GROSS CALORIFIC VALUE OF FUEL
UNBURNT FUEL
CARBON MONOXIDE LOSS
AVAILABLE TO BOILER
Series1
Series2


SUPERHEATER TEMPERATURE PROFILES
Temperature [Deg. C]
1400
1200
1000
800
600
400
200
0
-0.400
-0.200
0.000
0.200
0.400
0.600
0.800
1.000
Distance along superheater flue from firebox tubeplate [m]
Flue Gas Temp Deg. C
Wet Flow Deg. C
Wet Return Deg. C
Dry Flow Deg. C
Dry Return Deg. C

The Greatest Gathering

A chance to show the world what we can do!

The Greatest Gathering

Next Steps

- Complete cylinder assembly
- Final valve gear components
- Run on compressed air
- Boiler drawings
- Odds and Sods – e.g. buffers
- Fund Raising

Thank You!