



SUTPHEN

Family Owned and Operated since 1890!



Date 10/07/2024
Matt Fox – CBU Manager
Nick Maddalena – FVS Eng Leader

Chassis Round Table

- Chassis Team Overview
- Review of EPA Compliance
- Available engines in SQS
- Exhaust aftertreatment review
- Engineering timeline review
- Engineering timeline for full production
- Build documentation (revision) key dates
- Air Horn Update



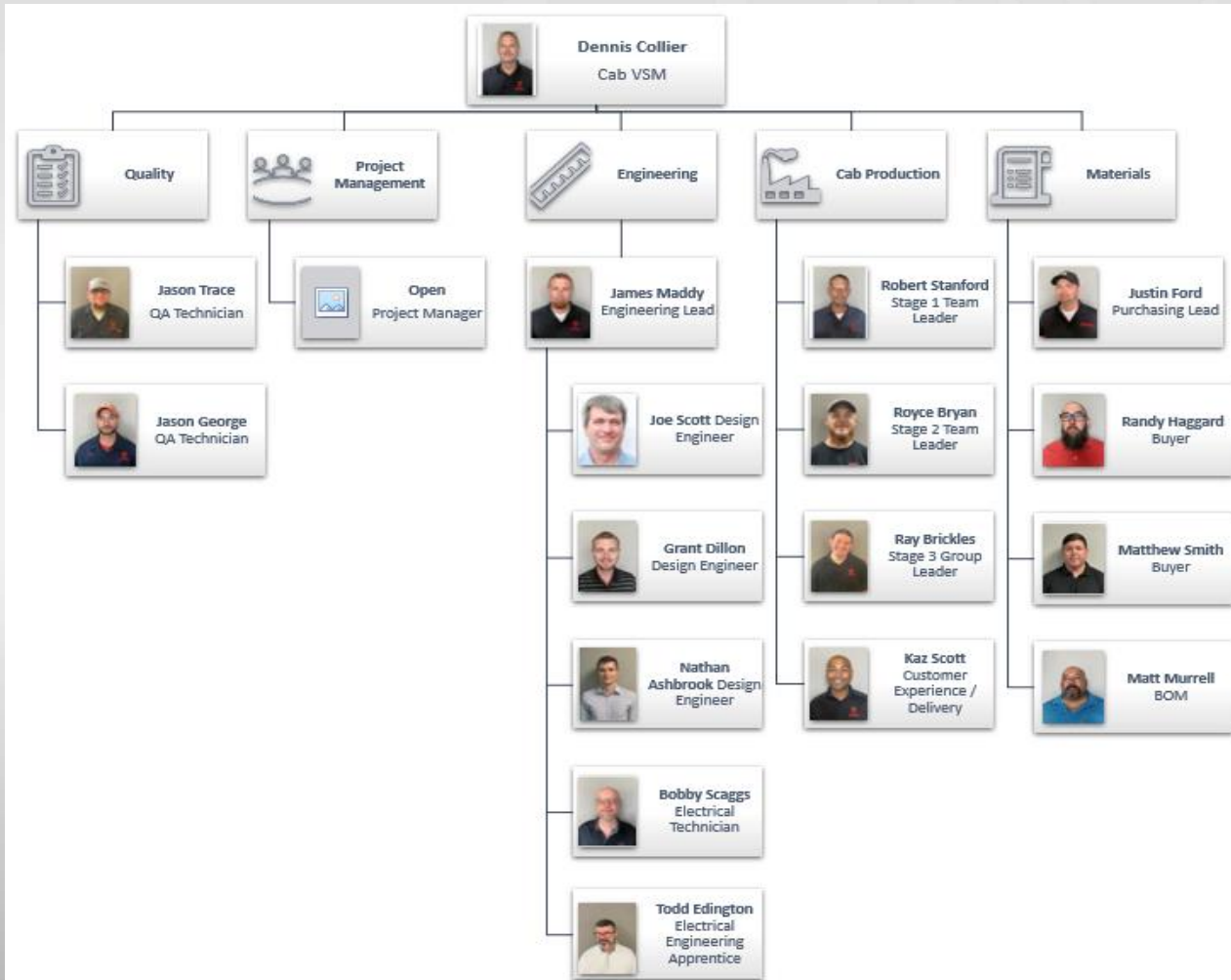
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Chassis Business Unit Org Chart



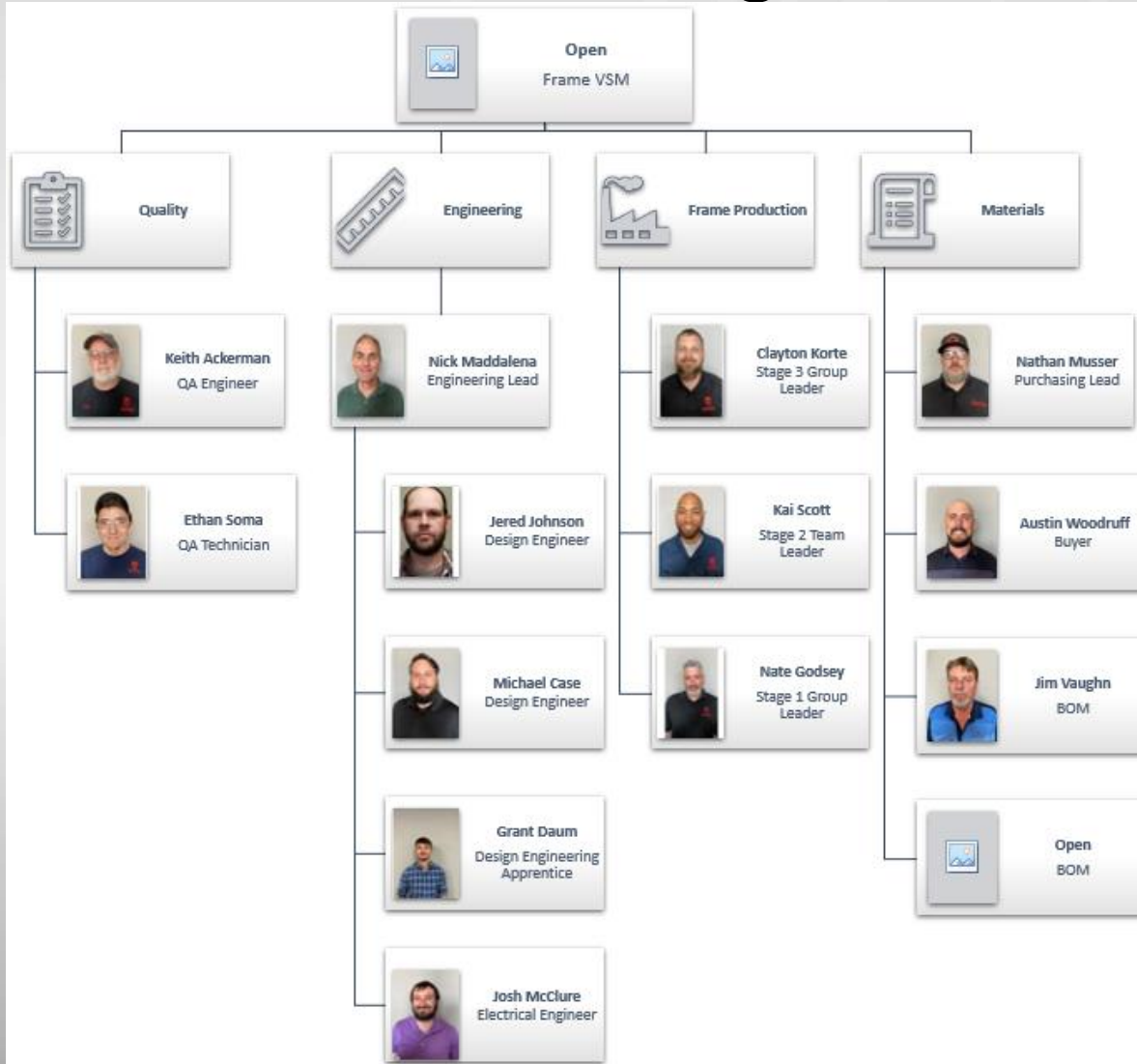
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Chassis Business Unit Org Chart



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Chassis Business Unit Org Chart



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Next Generation Engines – EPA Compliance 2026-2031

Vehicle emission regulations in the United States are driven by CARB (California Air Resources Board) and the EPA. Generally, CARB is more restrictive but applies to California only. However, Cummins applies the CARB requirements nationwide making it a de facto national standard. The two regimes will converge in 2027.

For Sutphen this translates into developing for 2026-27, new powertrains with two new Cummins engines: the Nextgen X15 (2026) and the new X10 (2027). The exhaust treatment systems will undergo very significant changes. Physically they will be nearly three times the size of the current systems in both mass and volume.

	2022	2024	2027	2031
EPA	EPA 200 mg NOx 185k mi EUL (MHD) 435k mi EUL (HHD) 100k mi Warranty	EPA 200 mg NOx 185k mi EUL (MHD) 435k mi EUL (HHD) 100k mi Warranty	EPA 35 mg NOx 350k mi EUL (MHD) 650k mi EUL (HHD) 280k mi Warranty (MD) 450k mi Warranty (HHD)	EPA 35mg NOx 350k mi EUL (MHD) 650k mi EUL (HHD) 280k mi Warranty (MD) 450k mi Warranty (HHD)
			2026 EPA 50 mg NOx "Pull ahead" provision	
CARB	CARB 200 mg NOx 185k EUL (MHD) 435k mi EUL (HHD) 150k mi Warranty (MD) 350k mi Warranty (HHD)	CARB 50 mg NOx 185k mi EUL (MHD) 435k mi EUL (HHD) 150k mi Warranty MD 350k mi Warranty (HHD)	CARB 20 mg NOx 270k mi EUL (MHD) 600k mi EUL (HHD) 220k mi Warranty (MHD) 450k mi Warranty (HHD)	CARB 20 mg NOx 350k mi EUL (MHD) 800k mi EUL (HHD) 280k mi Warranty (MHD) 600k mi Warranty (HHD)



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Next Gen Engines Currently Available in SQS

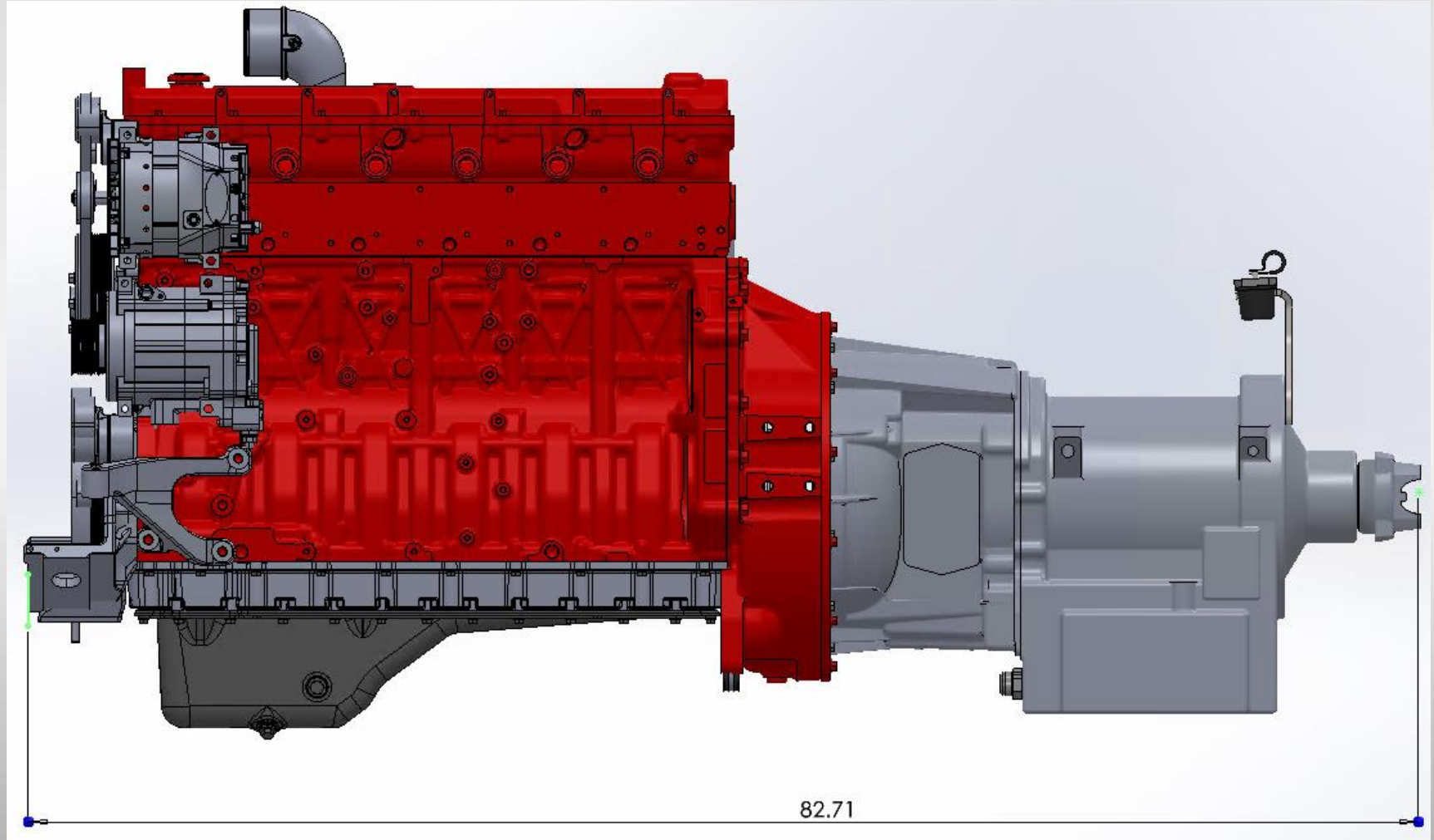
- X10 MHD (Medium Duty):
 - 380HP / 1250 LB FT + TM10 Exhaust
(Replaces L9)
- X10 HHD (Heavy Duty):
 - 450HP/1650 LB FT + TM13 Exhaust
(Replaces X12)
- X15N:
 - 505HP / 1850 lb ft + TM13 Exhaust
 - 565HP / 1850 lb ft + TM13 Exhaust
 - 605HP / 1850 lb ft + TM13 Exhaust



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X10 MHD: EVS3000

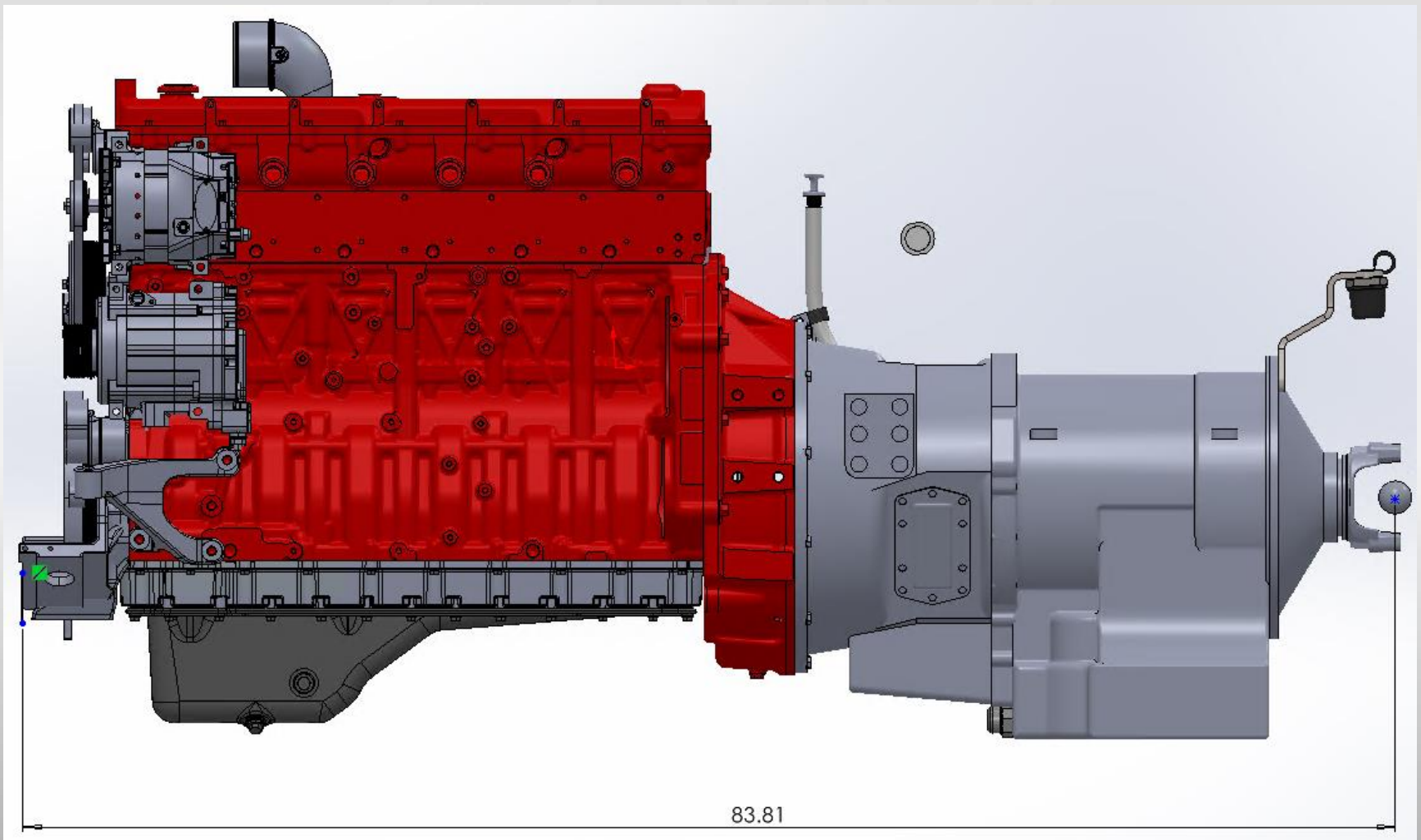
380HP* / 1250 LB FT + TM10 Exhaust



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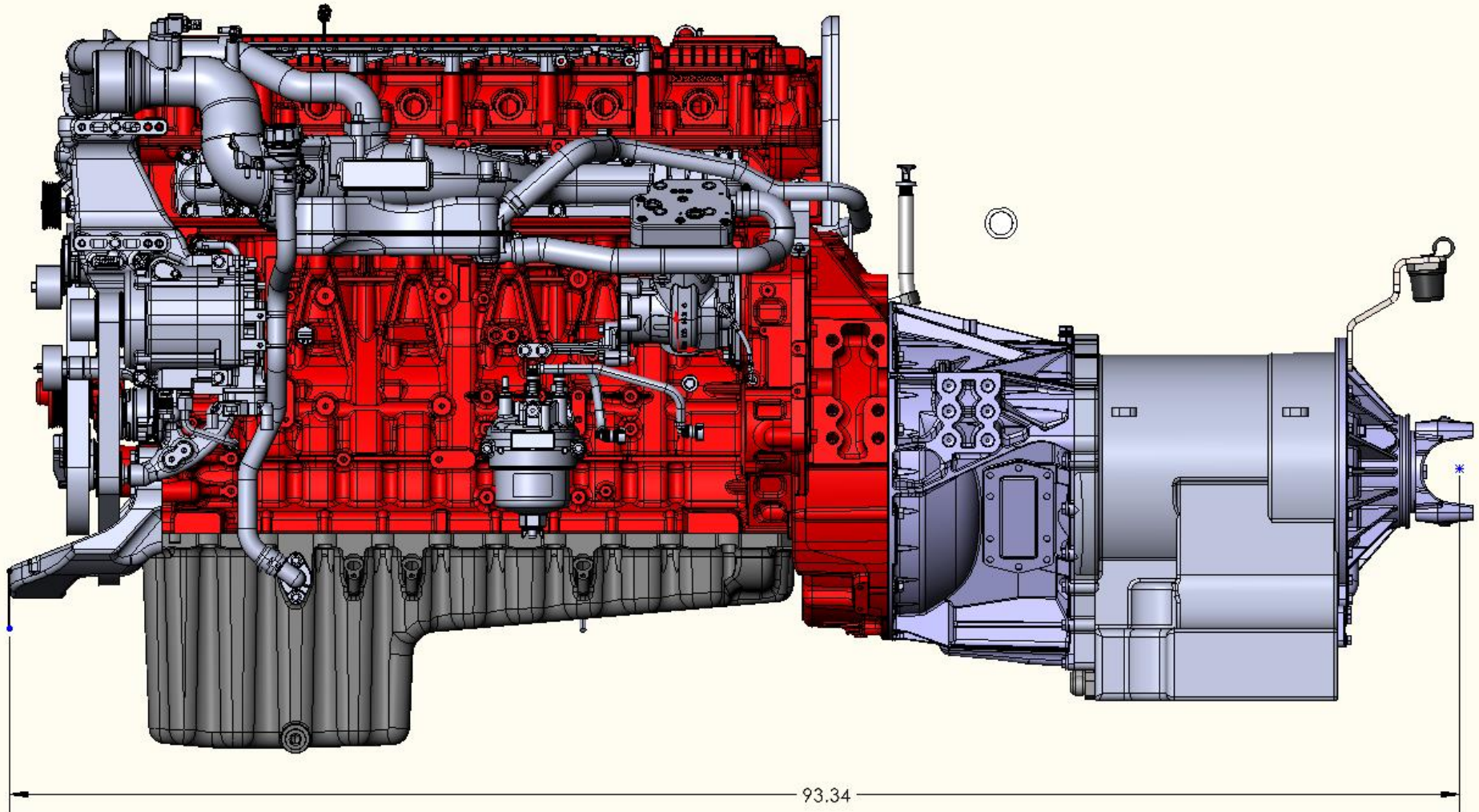
X10 HHD: EVS4000

450HP* / 1650 LB FT + TM13 Exhaust



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X15 Next Gen: EVS4000 605HP*/1850 LB FT + TM13 Exhaust



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2027 Powertrains Timeline for Testing & Production

	2026												2027											
	Q1			Q2			Q3			Q4			Q1			Q2			Q3			Q4		
X10 MHD																								
X10 HHD																								
X15																								

Key:	First Chassis Build	Engine Delivery / Installation	Testing	Partial production	Full production
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X10

- Construction & Testing : Q4 2026
- Phased production : Q1 2027 (final L9 & X12 and initial X10 trucks)
- Full production : Q2 2027

X15

- Construction & Testing : Q1 2026
- Phased production : Q3 2026 (final X15 and initial X15N trucks)
- Full production : Q4 2026

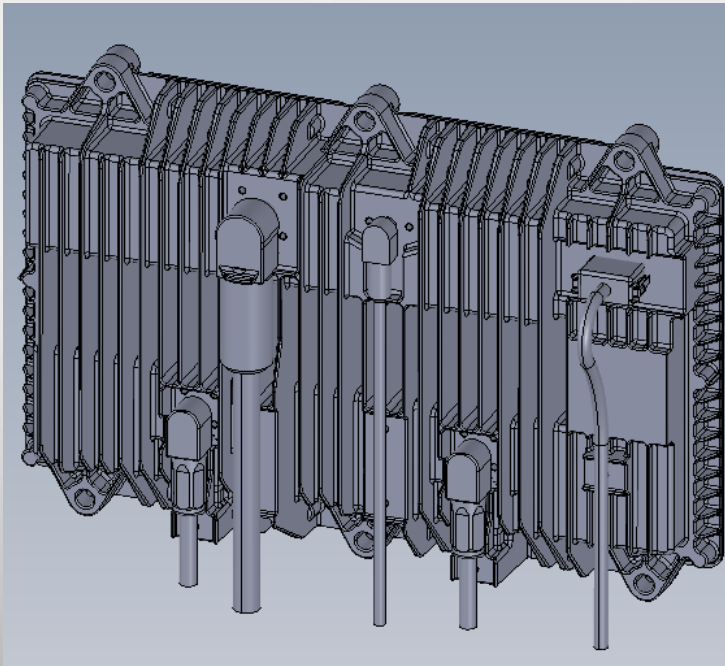


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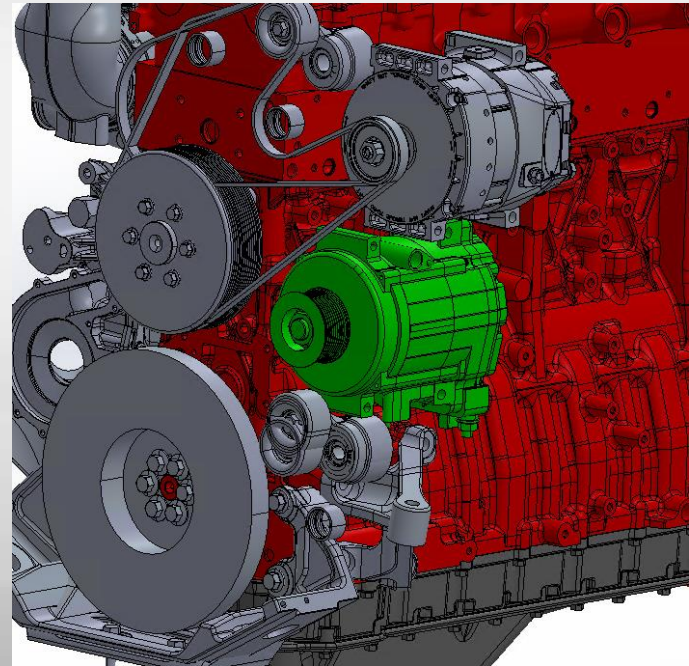
Major Changes: Electrical

The two aftertreatment units will each be equipped with a 5kW electric heater. One or more dedicated 48V generators are required to power these units. The engine will be equipped with an HCU (Heater Control Unit).

HCU



48V Generator



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Major Changes: Exhaust Hardware

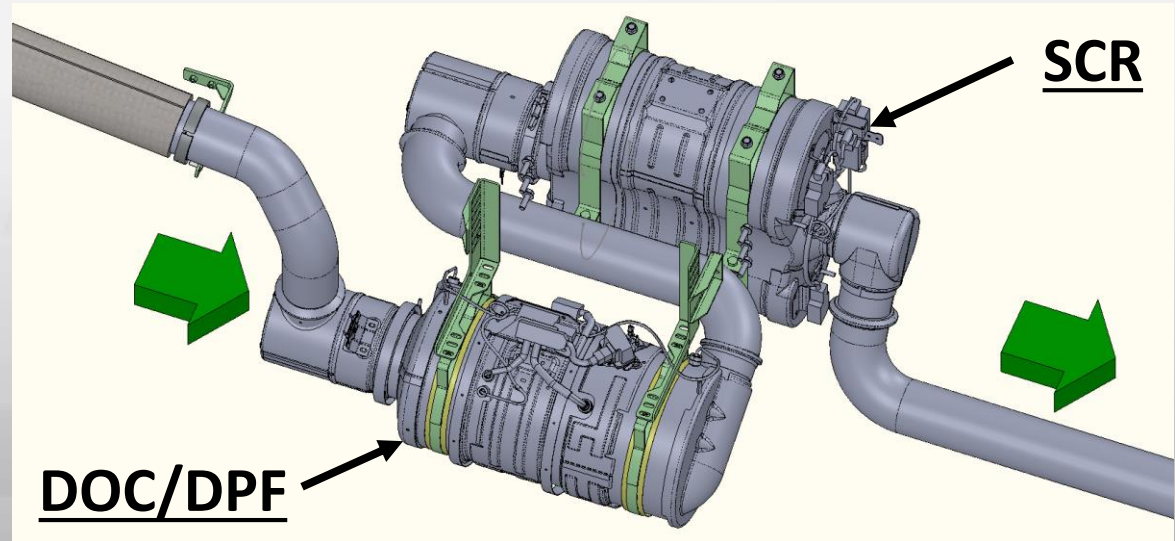
Maximum EPA NO_x (nitrogen oxides) permitted will reduce from 200mg per bhp-hr to 35mg. CARB will reduce to 20mg. Stricter requirements at engine start require a more complicated system.

There are two main components:

- The upstream unit, a combined DOC/DPF (Diesel Oxidation Catalyst/Diesel Particulate Filter) which includes the Decomp reactor (fed by the DEF system).
- The downstream unit, the SCR (Selective Catalytic Reducer).

Combined, the DOC/DPF & SCR units weigh almost 300 lbs. compared to today's 150 lbs.

Typical Aerial exhaust arrangement:

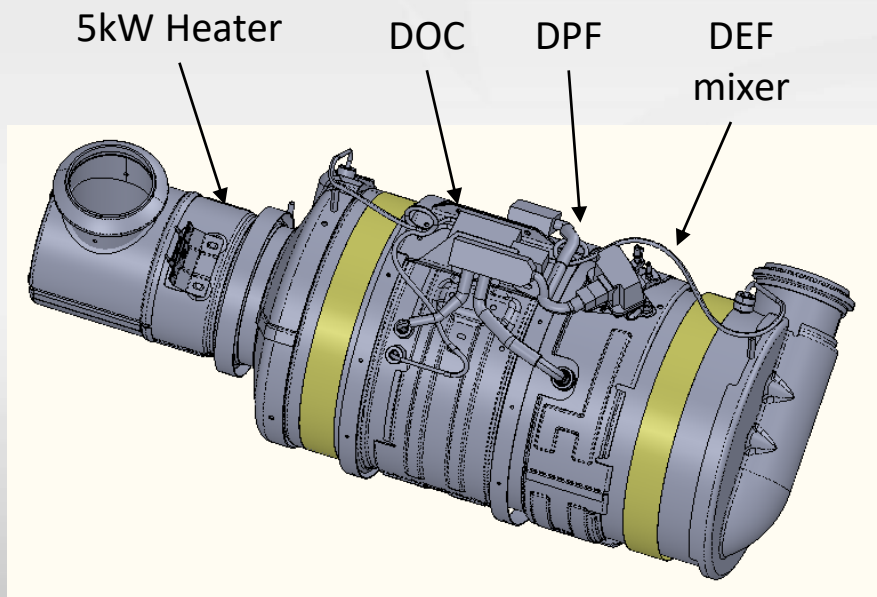


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Major Changes: Exhaust Hardware (cont.)

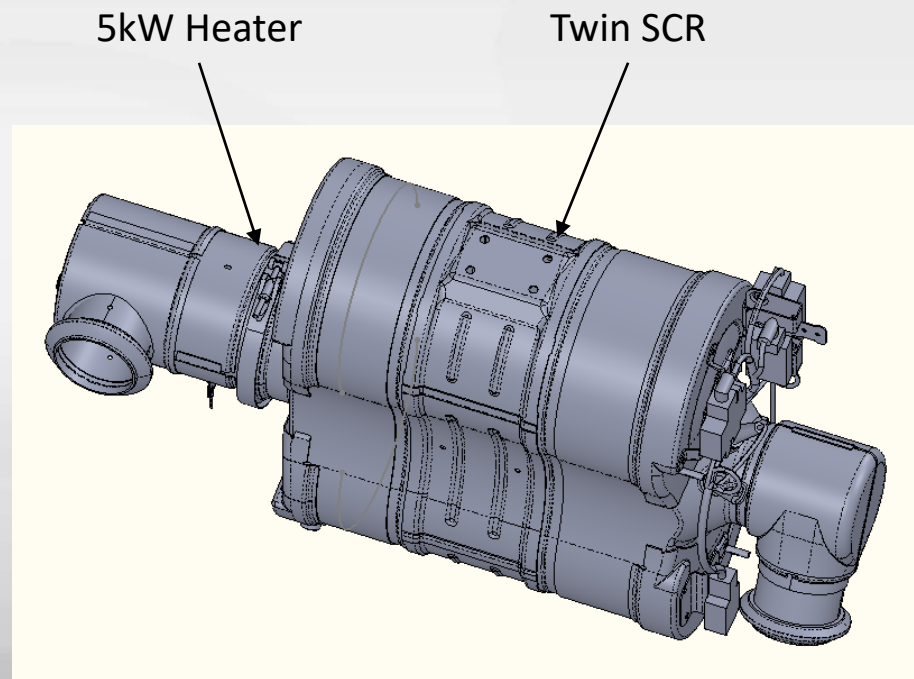
Upstream unit: DOC/DPF

(Diesel Oxidation Catalyst & Diesel Particulate Filter)



Downstream unit: SCR

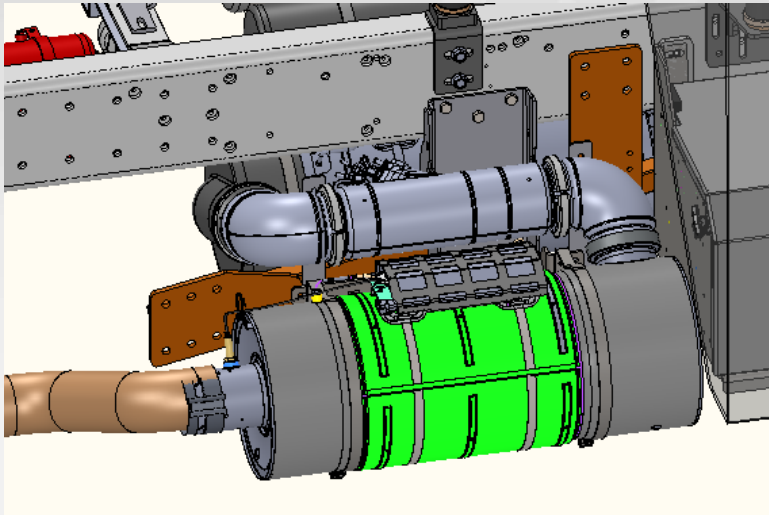
(Selective Catalytic Reducer)



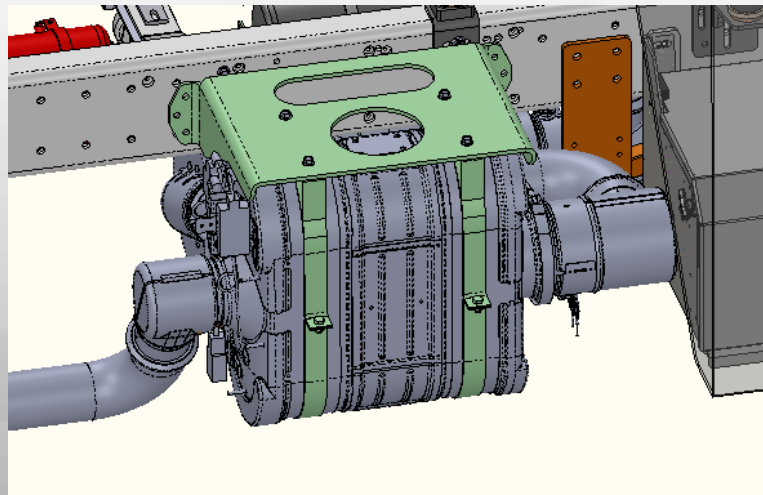
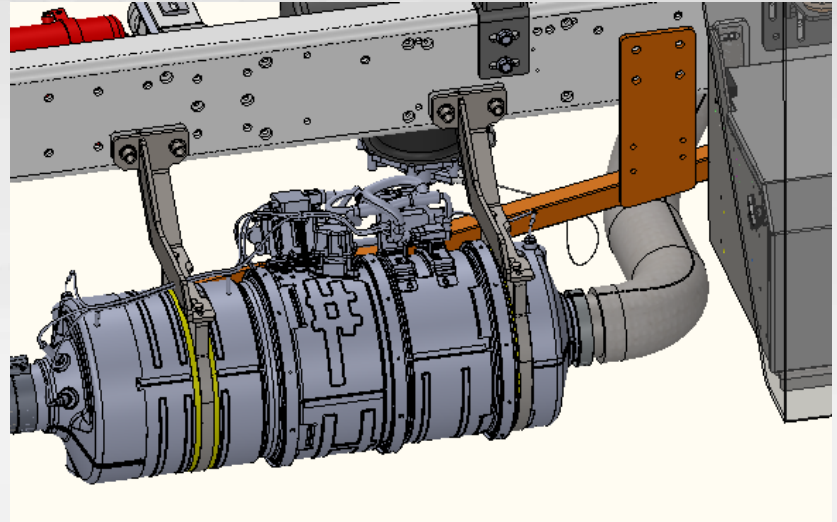
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Exhaust History

Pre-2017 Switchback:



2017 - Present Single Canister:



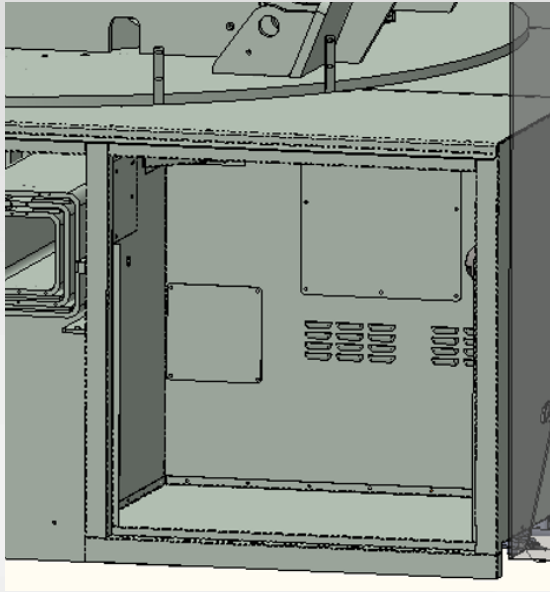
2026+:
Switchback
DOC:



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R1 Compartmentation

Pre-2017:

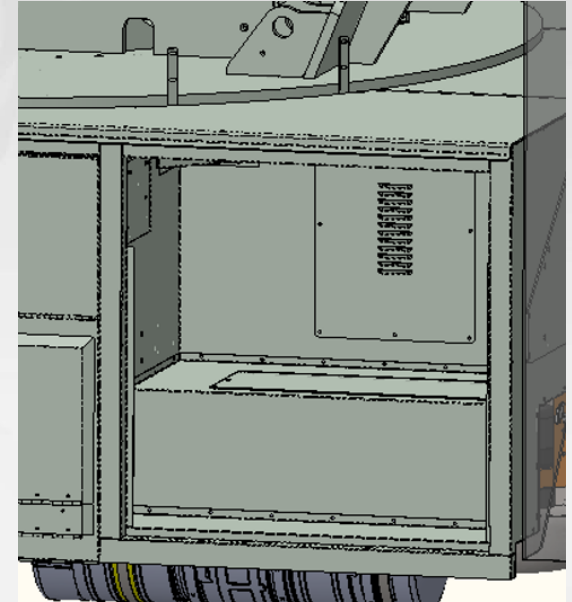


R1 compartment has been reduced thru successive generations of exhaust systems because of emissions changes.

2026+?



2017 – Present:



- Preliminary concept for 2026+
- The R1 may be removed entirely - ventilated and hot



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Cummins 2026 X10/X15 Engines

Chassis Engineering

- 2024 (June) – Establish preliminary space claims. This is complete and CAD data has been sent to the body facilities for compartment evaluation
- 2024 (July-Nov) – Adjust space claims/start designs. New CAD models are still coming from Cummins (beta models)
- 2024 (Dec) - 2025 (Mar) – Detail designs
 - Motor mounts
 - Engine bracketry
 - Cooling system – CAC pipes, water pipes, coolant overflow
 - Intake
 - A/C components
 - DEF system
 - Exhaust systems – Pumper/Aerial/Mini-Towers



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Cummins 2026 X10/X15 Engines

Chassis Engineering

X15 Proposed Timelines: **Full Production 2026 (Apr)**

- 2025 (May) – Drawings completed and ready for POs to be issued
- 2025 (July) – First Article Parts arrive for evaluation
- 2025 (Sept) – Chassis 1st build & instrument
- 2025 (Nov) - OTR testing and Dyno testing

X10 Proposed Timelines: **Full Production 2027 (Feb)**

- 2025 (May) – Drawings completed and ready for POs to be issued
- 2026 (Aug) – X10 First Article Parts arrive for evaluation
- 2026 (Oct) – X10 Chassis 1st build & instrument
- 2026 (Nov) – OTR testing and Dyno testing



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Cummins 2027 X10/X15 Release

- Due to the production delay at Cummins, Sutphen's current schedule reflects a significant number of projects that will be affected.

For those affected:

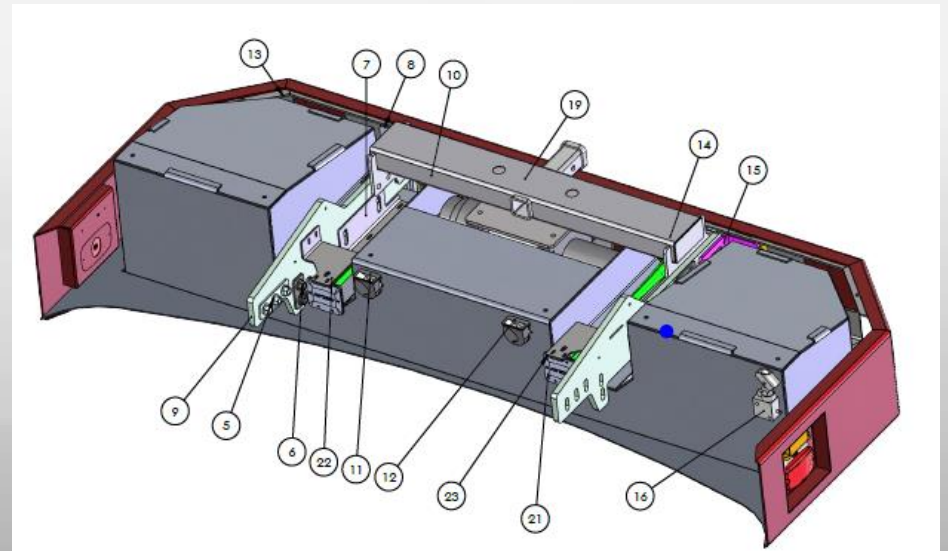
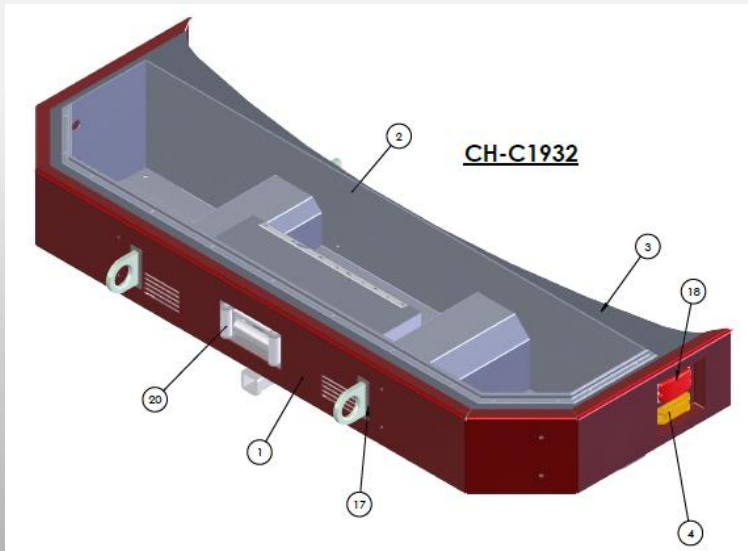
- X10 customers must select 2024 model engines (L9 or X12)
- X15 Customer must select 2024 X15 model engines
- A Sutphen representative will contact the dealer no later than 6 months prior to the planned chassis start date
- All revisions to build documentation must be submitted by August '26
- Final order for 2024 model engines will be submitted in October '26



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Air Horn – Supply Constraints

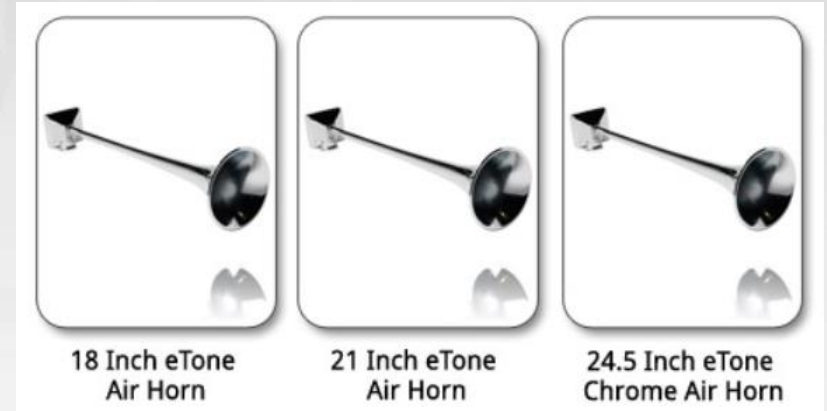
- Extended lead times – Grover (Air Horn Guys)
- Dual source Initiative – Flexibility
 - Grover & Hadley
- Bumpers designed for the Hadley installation
 - Inventory aligning w/ bumper configurations



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Air Horn – Supply Constraints

- Hadley Options
 - Round / Round E-tone / Rectangle
- General rule for installation
 - Pumper units - Hadley horns
 - Aerial Units – Grover horns
- Projected supply chain recovery (Grover)
 - Dec 2024



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Questions?



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