Supplier is encouraged to offer alternate(s) that would improve the performance of specified equipment, process enhancements. In this document, DTNA refers to the Daimler Trucks North America Santiago Paint Project Team.

Current Condition:

Bulk Colors – 6 colors- re-circulation system fed from Volumetrics Room
Bulk Solvent – single re-circulation system fed from Volumetrics Room
Bulk Catalyst line- single line re-circulation system fed from Volumetrics Room
Bulk Clear Coat line- single line re-circulation system fed from Volumetrics Room
Current manual systems use 4 special color systems and 6 bulk colors through the use of Graco P-Mix 2KS

Functional Requirements:

In the new system the expectation is that:

1) Tact time for entire system will be 7 minutes.
2) Manual cut in for doors, access doors and baggage doors will be done before the automated zone for both base coat and clear coat.
3) Both clear coat robots will be supplied with bulk solvent, clear coat and catalyst.
4) Both manual clear coat spray sections will be supplied with bulk solvent, clear coat and catalyst.
5) Both base coat robots will be supplied with bulk colors (6), solven and catalyst. They will also be supplied with special colors (resin only)
6) Both manual base coat sections will be supplied with bulk colors (6), clear coat and catalyst. They will also be supplied with special colors (resin only)
7) The manual clear coat sections will provide gun 2 flush boxes and plural component mixing. Pumping and piping to waste solvent is included in scope.
8) The manual base coat sections will provide gun 2 flush boxes and plural component mixing. Pumping and piping to waste solvent is included in scope.
9) Manual clear coat zone will be able to paint catalyzed clear coat where the resin is supplied by bulk clear coat line from 2 guns. Catalyzation equipment is included in this scope.
10) Manual base coat Zone will be able to paint catalyzed paint where the resin is supplied by both special color systems and each of the 6 bulk colors from 2 guns. Catalyzation equipment is included in this scope.
11) In the manual sections, for special colors, and for bulk colors, the combined purge/clean and color change time must not affect the operator's ability to complete the cut-in application within 7 minutes. There are to be 2 operators in each manual section (base coat and clear coat). In the manual booths at Santiago today, this is accomplished by having 4 special color systems. The Vendor is expected to determine the suitable number of special color systems.
12) In the automated base coat zone,for special colors, and for bulk colors, the combined purge/clean and color change time must not affect the robot's ability to complete the cut-in application within 7 minutes. There are to be 2 operators in each manual section (base coat and clear coat). In the manual booths at Santiago today, this is accomplished by having 4 special color systems. The Vendor is expected to determine the suitable number of special color systems

13) Vendor is to validate and advise Santiago project team if any of the current bulk delivery systems are not able to provide adequate flow and pressure to the both the manual and automated zones.
14) Ideally a single pail will feed both the manual and base coat color sections.

Regulations and Safety Standards:

The provisions and requirements of local licensing authorities and special factory provisions issued are to be followed. These are not limited to NFPA33 and NPFA 79.

Material Requirements:

Only materials that are suitable for paint and solvents in design and resistance will be permitted for all installations and equipment. The paint compatibility of all materials must be tested and proved. This applies in particular to all parts that come into contact with paint and purging agents. Pipe dope has caused severe contamination in a past project and its use must be approved by DTNA before being used. It should be noted that all supply systems are purged with all purging agents (clean and dirty purging agents, additives) and therefore the parts that come into contact with these agents must be suitably compatible. Installations such as material containers, pipes, fittings, pumps, filters, etc. that come into contact with agents (paint, solvents) must be made of corrosion-resistant stainless steel and must not contain any nonferrous heavy metals. Furthermore, it must be ensured that no electrochemical corrosion occurs in welded joints of different stainless steels. Below is a list of approved stainless steel materials:

- 304 SS Tanks
- 316 L SS Pipes
- 316 Ti SS Fittings, pumps

Further approvals must be applied for by the contractor from DTNA. The Contractor shall submit compatibility certifications for all equipment that comes in contact with the paint and solvent materials. The following materials can be used after appropriate examination and approval:

- PTFE (Teflon)
- Viton (attention must be paid to swelling)
- Kalrez
- no sealing tapes, e.g. Teflon Tape

System Design:

The installations are to be designed according to state-of-the-art technology, with the single subassemblies being designed as modules.
Care should be taken that the consumptions of power, paint, solvents and purging agents are kept to a minimum.
The installations are to be designed so that any necessary repair work can be carried out easily and quickly and without modifications. In the event of repairs, it must be possible to replace defective parts quickly by loosening bolted flanges or quick

connections. Furthermore, the installations must be designed to require minimal maintenance. The compressed air connections on the pumps must be quick connect in accordance with the component specifications.
All components must be:

- Undercut-free
- Smooth-walled and welds must be pickled and purged
- 10% of weld seams must be tested
- Minimal amount of adhesive joints; e.g. In threads
- With properly sized cross-sections and shortest possible pipe lengths
- Minimal amount of dead space, designed for optimum flow properties
- Easy to clean and maintain (accessibility, replaceability)
- Hose material and seals: free from parting agents, silicone based materials, and plasticizers
- The design, arrangement, and selection of components must be approved by Freightliner preferred components can be found elsewhere in these documents.
- The arrangement of assemblies and subassemblies should ensure easy accessibility and
exchangeability.
- For economic reasons and to ensure short assembly times, the installation should be designed so that as much pre-assembly as possible (modular build) can be carried out in the workshop so that subassemblies can be delivered to the building site as large, pre-assembled, similar units. The units shall arrive at the project site covered with plastic “shrink” wrap. This plastic covering to remain in place during the construction period - Mix tank/systems designed differently must pass a preliminary acceptance test at the supplier's premises before delivery is made. The preliminary acceptance test should be scheduled such that any necessary modifications do not endanger the overall time schedule.
- The size of such pre-assembled, similar components should be suitable for the transport and delivery circumstances at the building site.
- Approval Drawings are required for the modular pumping equipment and paint circulation piping.
- The Contractor shall submit for approval paint system equipment consistent with the intent of these specifications.
- The identification of all components should be in accordance with industry accepted standard practice. Deviations are only permissible after consultation with DTNA.

Assembly and Start Up

In addition to system commissioning and start-up requirements the following plant specific guidelines will apply:
Openings in walls, ceilings and floors and appropriate seals (if necessary, fireproof) will be made at the cost of the contractor. The openings with the appropriate seals will be constructed by the supplier for construction work.

Welding

General requirements:

- All international standards about welding are collected in the catalog of CEN/TC121 (general technical report for national standardization; internet ww.nil.nl/normen_e.htm). The whole welding process must be done according to these standards.
- Valid for material supply equipment generally.
- Welding work may only be carried out by welders who have proved their suitability by a test in accordance to the ASME B31.3 and who possess a valid test certificate.
- The same requirement is applicable for operators of orbital welding equipment. They must have proved their suitability by a test and they must possess a valid test certificate.
- At the time when welding is done, a valid test certificate must exist for the welding method to be used in accordance to the welding standard, a valid process test for the tungsten-inert gas welding method on material ANSI 316L must be available.
- Only inverter-controlled power supplies with HF ignition should be used for welding.
- All tools and material to be processed must be free of grease and silicone.
- Supervising staff for welding must be named by the contractor before commencement of work.
- The material for all items to be welded is AISI 316L. Certification proof must be presented and included in the documentation.
- Design of pipes according to DIN 11866 with DIN 11850 Reihe 2, heat treated, with certificate
- All components that are welded in the installation must be suitable for orbital welding (sufficient limb length for mounting in the cassette welding head)
- T-pieces in the ring pipe corresponding to the ring pipe cross-section and wall thickness and at the branch to the outlet with suitable dimensions; branch with sufficient length so that pipe section to the outlet can be welded using orbital method
- T-pieces with neck (it must be possible to attach following fitting flush and correct with one single weld)

Manual welds:

- Should be made only after consultation with Freightliner
- Should only be made when orbital welding is not possible
- Should be Tungsten Inert Gas (TIG) where applicable
- Filler metal will be used in limited cases where required and will be appropriate for components being joined.
- Manual welders must be named by the contractor before commencement of work (proof of qualification with test welds)
- Length of preliminary flow period to purge out the oxygen should be such that no tarnish can occur (proof using a residual oxygen meter)
- Shielding gas must be effective both inside and outside the pipes in order to prevent tarnishing (in particular on the inside of the pipes).

Welding and forming gases

- Welding gas: argon/hydrogen 98/2, purity at least 4.8 (99.998%)
- Forming gas: argon/hydrogen 98/2, purity at least 4.8 (99.998%)

Preparing the weld

- Weld ends at a right angle, level and no burrs
- Before welding, weld ends must be absolutely free of grease and dirt at a minimum distance of 2 inch [50 mm] from the weld seam
- Approval from Freightliner for the use of cleaning agents
- Machining of the pipes only with tools suitable for machining stainless steel
- Cutting of pipes only with glass fibre pipe saw with a saw blade for stainless steel (No metallic blades allowed)
- After pipes have been cut, remove all debris and burrs from the pipes
- The use of lubricants or coolants is forbidden.
- Piping must be cut true and square in accordance with industry standards for welding.
- All necessary equipment and aids (clamping, cutting, centring and forming equipment) should be checked to ensure that they function properly and repaired immediately in the event of any faults.

Making welds

Butt weld I - butt, in accordance with DIN EN 29692 (symbol ISO 2553)
Not permissible:
- Pores raised welding seams local projections, edge displacement
- Sunken welding seams notched welding seams
- Air gaps
- Ensure complete welding of the welding butt. As a guideline the width of the weld should be about 2.5 times the wall thickness of the pipe.
- No “sugaring” of the weld will be permitted.
- The weld should be even and as smooth as possible inside and outside.

Check welds visually:
- 20% visual inspection of all welds from outside by the welder, from inside (root side) using an endoscope

Scope of test with endoscope from inside:
- manual welds 20%
- orbital welds 10%

If a weld has not been made correctly, it must be removed from the weld at a distance of at least 0,6 inch [15 mm]. Welding over the weld is not allowed. Welding faults must be ascertained and the sources of the fault remedied immediately so that there are no repeat occurrences.
Welds that do not comply with the specification must be replaced by the contractor without costs to Freightliner.

Documenting welds

The following minimum information must be documented:
- Name of the welder
- Welding machine (welding apparatus)
- Date of the weld
- Welding parameters or welding program
- Number of the weld
- Welding current in the case of manual welds
- Tests performed and their results
- Documentation should always accompany production (welding supervisor provided by the contractor
is responsible for correct execution)
- New and replacement welds should also be documented

Finishing welds

- Remove tarnish on the outside of pipes with pickling paste and Scotch Brite tape only.
- Removal of tarnish with stainless steel brushes is not permissible.

Pressure and leak tests

After completion of assembly (also sections of the installation), pipes, fittings, filters, pumps, etc. should be subjected to a pressure and leak test (maintain pressure over 8 hours and make report with x-t recorder). All parts, in particular welded pipes, must previously have been blown out with nitrogen. A detailed 3-fold report should be made. The pressure and leak test as well as the remedying of any leaks and malfunctions in supplied and assembled parts is part of the scope of goods and services. If necessary, installation components (nominal pressure < test pressure) must be disassembled and bridged. After successful tests, the entire installation should be purged with an agent that has still to be specified.
Only nitrogen should be used to empty pipes after they have been purged with solvents. Testing pressure and the corresponding agents the testing pressure applies for pipes and fittings. In general, the test period is per code requirements (4 hours minimum). A report should be made for every test section. Before tests are made with liquid agents, the items should first be tested with compressed air and then with purge solvent. All tests and the staff or authorities required to do them are included in the bid price. Test pressure = 1.5 x operating pressure, at least 350 PSI [24 bar]!

Testing agent

- 2-Component Top Coat Solvent
- 2-component clear coat Solvent
- Purging Solvent

Tube Bending:

- Bending radius for the system group pipe work > 3 x pipe diameter

- Bending radius for the ring pipes from the container group, e.g. For
- Pipe 1" [29x 1.5 mm] / > 6 x pipe diameter
- Bend pipe with a drift (Amco drift).
- Pipe bends are to be smooth without "ripples".
- The heel of the pipe bend to have no evidence of thinning
- Samples of pipe bends to be submitted for review prior to fabrication

Pressure test and leak test:

- This section is a duplicate of 9.4.5 "Assembly and Start-up"
- Minimum information to be documented:
- Date of the pressure test
- Name of the person responsible
- Duration of the pressure test
- Test pressure
- Testing agent
- Nominal diameter of the pipe
- Permissible operating overpressure
- Number/name of the pipe

Purging procedure:

- The acceptance test for proper purging and cleaning of installed pipe systems will be carried out by DTNA together with the contractor and the paint supplier.
- Supply of clean materials and disposal of used materials are the responsibility of DTNA.
- Approval of the purged systems will be made together by DTNA, the contractor, and the paint supplier.

Technical Specifications:

Design Criteria

The various pipe sizes, tube sizes, and pipe wall thicknesses listed in this document are for bid purposes only. The contractor shall complete all static and dynamic calculation using appropriate computer modeling techniques to ensure that the listed paint system design parameters are met.

As a reference some typical paint colors and their respective paint properties are included.

DuPont Imron Elite Mixed Paint Viscocities

			Viscosity in seconds- Zahn 3 cup			
					Viscosity after	Viscosity after
Code	Color	Metallic	Unactivated	Activated	30 Minutes	60 Minutes

N0006EA	White	N	15.2	13.8	18.5	24.4
N0303EA	White	N	15.3	13.9	16.7	20.3
L0007EB	White	N	13.5	12.5	12.6	14.6
N0225EA	White	N	15.2	13.8	18.5	24.4
L2050EB	Orange	N	12.9	12.3	13.9	15.7
N3781EA	Viper Red	N	15.3	12.1	13.1	14.2
N0166EA	Red	Y	15.2	13.8	18.5	24.4
L2685EB	Red	N	19.7	17.5	23.5	26.9
L0303EB	White	N	20.3	13.7	13.9	15.3
L2832EB	Yellow	N	13	11.7	12.8	14.3
N0450EA	Green	N	15.3	13.9	16.7	20.3
N0226EA	Blue	N	15.3	13.9	16.7	20.3
N0001EA	Black	N	15.2	13.8	18.5	24.4
L3781EB	Viper Red	N	13.1	13.1	13.3	13.7