

## DLW : Initiatives for Crew Comfort and Safety



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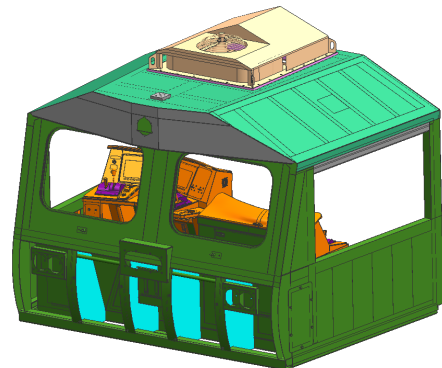
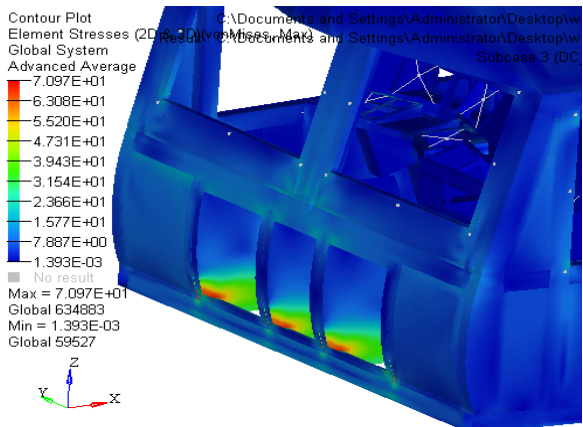
There are several factors which affect the safety and reliability of train operations. However, loco pilots being at the forefront of train running are probably the most important. Therefore, Indian Railways has always endeavored to equip this human resource with the necessary technical and operational competencies. Indian Railways has of late also started working towards providing the optimum working environment for this critical human resource.

As a locomotive designer and manufacturer, DLW has an important role to play in this regard. Recognizing this responsibility DLW had in the past worked with National Institute of design to improve the ergonomics of the Alco locomotive cab. DLW stays committed to this task . and in the recent past , a number of initiatives have been taken for enhancing crew comfort and crew safety.

In recent years the steps taken to ensure crew comfort and safety by DLW are enumerated below

- EN12663 Compliant Collision Protection in WDG5 cab
- Improved Visibility in WDG4/WDP4
- TFT Display Screens
- Improved driver seat
- Modified Computer Controlled Brake System (CCB – II)
- Roof Mounted Compact Air-Conditioning System
- Provision of Cab Heaters
- Provision of toilet in WDG5

### CAB COLLISION PROTECTION



When the new generation WDG5 locomotive was designed, one of the important decisions taken at the designing stage was to provide collision protection for crew safety in compliance with international norms. In this respect, UIC 12663 standard was adopted. The cab design was modified, the CCB relocated, collision posts provided and validated through FE analysis. The cab is now designed to take 400kN at the collision posts and 300 KN at the cab front wall. \_

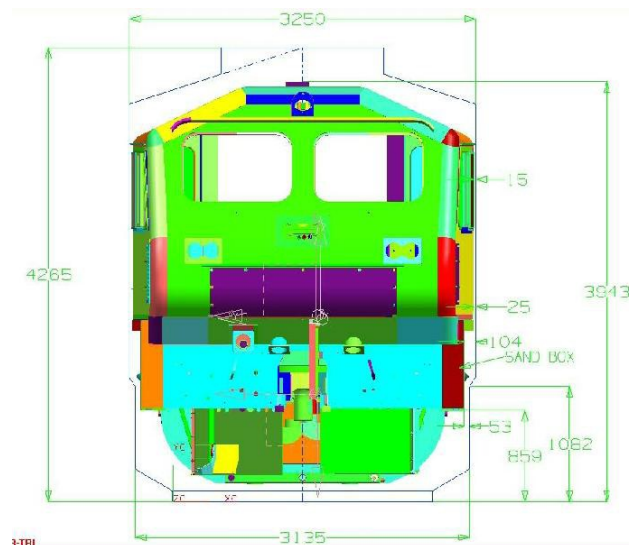
### **Wider Cab with improved visibility in WDP4/WDG4 locomotives**

A few years ago, South Western & Central Railways had raised the problem of poor visibility during Long hood driving in WDP4/WDG4 locomotives.

This problem was studied in detail at DLW from the feasibility of design point of view and the cab structure drawing was reviewed in which both side walls of cab structure was extended 225mm on either side. In that case rear portion of the cab was made 3200 mm wide well within the MMD to facilitate clear visibility in long hood drive to the crew and bay windows were eliminated in new design. To operationally use this extension, the size of looking glass was increased from 371 to 486 mm and driver seat was shifted outwards.

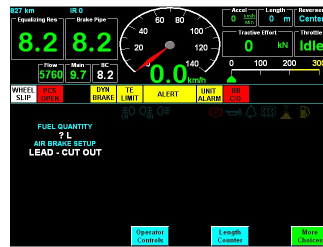
To enable the above the top of under frame beneath the cab was also required to be widened accordingly. Due to this reason, the front sand box, piping and electrical wiring connecting both control desk was modified. Also, side windows, door frame and both cab doors were re-designed .

The front view of 3-D model of the locomotive can be seen below -



Regular implementation was started by DLW from April 2010. Due to the substantial benefits of this initiative, Railway Board has also introduced a RSP programme for conversion of existing locomotive cabs in the field.

### TFT\_FIRE Display screens :



All the advanced railways in the world are switching over to TFT based displays. These displays have the following advantages.

- It is a single display system and can provide all displays required by crew.
- It provides better visualization of data.
- It can provide multiple pre-configured screen to standardize the requirements.
- Allows interactive interface

The TFT displays reduces crew fatigue and improves crew reaction . Besides Dial type pneumatic gauges being used presently need frequent maintenance. The proposed technology up gradation of TFT LCD display for gauges will be maintenance free.

DLW has adopted this technology in the new design WDG5 with adoption of AAR S591 compliant FIRE ( **F**unctionally **I**ntegrated **R**ailroad **E**lectronics) Technology which is interactive, enables the locomotive crew to perform a number of functions related to requesting information, reset faults, set up subsystems, receive fault messages, perform tasks e.g. traction motor cut out.

Similar technology has also been adopted on WDP4D and WDG3A locomotives .

### Improved and Ergonomic design of driver seat

The driver seat is a critical component which affects the crew fatigue, crew efficiency and ergonomics. Therefore over the years, several efforts have been made to progressively upgrade the seat . DLW has worked with an industry leader to provide a rugged seat with the following features:

- Forward and Backward movement-180mm

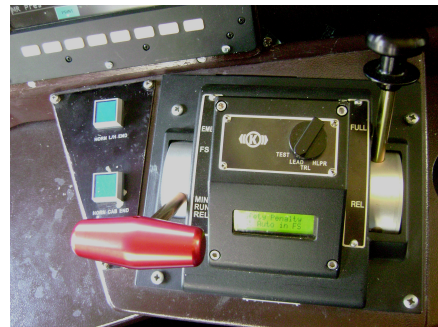
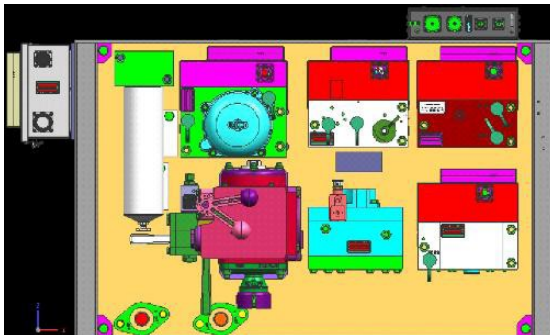
- Up and Down movement -100mm
- Rotational movement -360 degree
- Back rest reclining feature -30 degree +\_3 degree

These seats have been fitted on five locomotives till now. Another 30 loco sets are being procured for wider trials.

### **Modified Computer Controlled Brake System (CCB – II)**

The adoption of CCB-II besides bringing in several advantages for locomotive maintenance and reliability , also improves crew reaction . CCB-II provides for display of faults and status on the brake controller. It also allows the crew to by pass a faulty CCB and clear the block section. CCB-II provides for a direct port to access data for distributed power and any other application.

DLW has recently provided this technology on a WDG4 and WDG5 locomotive. DLW intends to provide this feature on 50 locomotives this year.

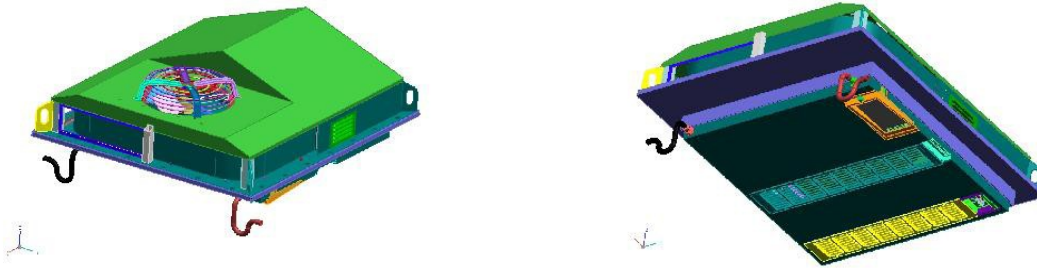


### **Development of Air conditioning units on Diesel Electric locomotives**

The development effort for air conditioning of EMD locomotives were started in 2004 with placement of two developmental purchase orders . The AC supplied had separate inverters and air conditioning units. 09 units supplied by M/s Sidwal were fitted on locomotives and all did not perform in field because of various problems and were removed from locomotives. These units were bulky, were protruding inside cab, thereby reducing head space and causing difficulty in accessing control compartment also. These units also did not have heating facility.

Learning from this experience the specification was revised to have compact design, embedded inverters, heating elements, improved maintainability and a proven design. DLW has procured five air conditioning units as per the new specification from Dayton Phoenix . One each of these units have been successfully fitted on passenger and freight application.

DLW has provided for air conditioned cab in the new generation WDG5. It is also going to provide air conditioning on WDP4D locomotives on trial basis.



**Model of compact air conditioning unit**

### **Development of Cab Heaters on Diesel Electric locomotives**

Diesel locomotives are operating in extreme weather condition in Indian Railways which include extreme cold conditions. These causes extremely uncomfortable situation for loco crew as there are no heating arrangement provided on diesel electric locomotives. There have been continuous demand from loco pilots for a very long time for cab heater in diesel electrics locomotive as in Electric locomotives. Considering above fact, DLW took initiative to develop cab heater system for diesel electric locomotive.

DLW specification no. WDG4/EL/PS/29 (Rev R0) is prepared by DLW for procurement of cab heaters. The specification for the cab heater is so designed that developed product can be used in both EMD and Alco locomotives. It can easily be retrofitted in existing locomotives in field. This would be very useful for retro fitment purpose.



**Cab heater fitted on loco**

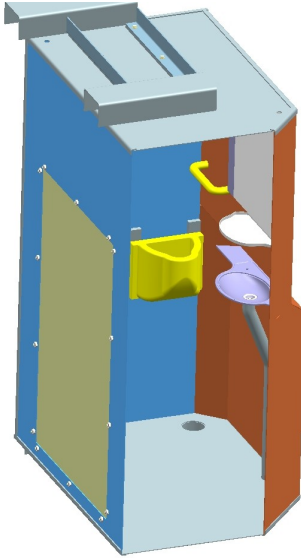
15 nos. of cab heater system supplied by M/s Topgrip are fitted on locomotives and dispatched to various sheds in the months of Dec 11 and Jan 12.

The cab heater developed having total 1.5 KW of heating capacity and two blowers at either end to blow hot air. These blowers are driven by rugged design 3 phase induction motor. The complete unit is modular in design, housing all

accessories such as heating element, Blower and motor, Inverter, fuses, Circuit breaker, switch etc.

After a trial period of six months, DLW is planning to adopt this feature on all locomotives.

### **Toilet on locomotives**



The crew runs on freight locomotives are quite long and strenuous. The crew is normally expected to work for 8 hours and on occasions has to work for 12 hours. These tough conditions call for provision of toilet on the locomotives. DLW has made a start in this direction by providing a toilet on WDG5 locomotive. The toilet module though initially provided with a urinal and a washbasin, has been designed to retrofit a commode with a retention tank once a toilet design to last 90 days is available in the industry. \_

DLW remains committed to continual improvement in providing a safe, conducive and ergonomic work environment for loco pilots.