

BHARAT HEAVY ELECTRICALS LIMITED, TIRUCHIRAPPALLI – 620014
LOGISTICS



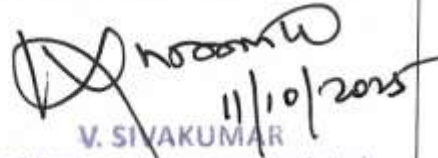
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WORK INSTRUCTIONS FOR
SAFE LOADING AND LASHING OF
FINISHED GOODS (PRESSURE PARTS)
AT LOGISTICS AND VENDOR LOCATIONS

RECORD OF REVISIONS

REV. NO:	DATE	DETAILS OF REVISION
01	11.10.2025	Clause 4.0 modified

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1.0 SCOPE

This work Instruction details out the activities to be performed for safe loading and lashing of pressure parts at Logistics areas.

2.0 CATEGORIES OF PRESSURE PARTS AND VEHICLES

- 2.1 Coils, Water wall panels, Loose tubes, Lines and links, Headers, Vessels etc. are falling under pressure parts category.
- 2.2 Vehicle categories are as given as below

Check the load capacity of the vehicle before stacking any materials to ensure that it can handle the weight and size of the materials.

SL	Veh. Cat.	Vehicle Type	Approximate Consignment Weight Range **	Basic Dimensions of the consignments L X W X H (in meters)		
				Length	Width	Height
1	T2A	Smalls & Part Load (LCV / Lorry Category)	Up to 5.5 MT	5.50	2.00	2.00
	T2B	Smalls & Part Load (Trailer Category)	Up to 5.5 MT	12.20	2.40	2.20
2	T3	LCV / Lorry / Trucks	Up to 9 MT	5.50	2.00	2.20
3	T4	Taurus / Multi Axle trucks	Up to 21 MT	6.50	2.20	2.20
4	T5	Mechanical Trailer Non ODC & ODC	Up to 41 MT	Non ODC: 12.20 ODC : > 12.20 to 15.00	Non ODC: 2.40 ODC: >2.40 to 4.00	Non ODC: 2.20 ODC: >2.20 to 3.00
5	T7	Mechanical Low Bed / Semi Low Bed Trailer	Up to 41 MT	12.20	>4.00 to 6.00	> 3.00 to 5.50
6	T8	Mechanical Long Bed Trailer	Up to 41 MT	>15.00 to 24.5	4.00	3.00
7	T9	Hydraulic Axles	> 41 MT	As per no. of axle	4.50	4.20

3.0 GENERAL LOADING AND LASHING INSTRUCTIONS

- 3.1 Items that are to be loaded in the vehicle are to be identified and segregated based on the weight and volume.
- 3.2 Items that are weighing less than 10Kg (or less than 1 metres) are to be bundled/packed in boxes/crates to make it convenient for handling, loading, transportation, and safe unloading at customer end.
- 3.3 **Selection of lifting tools and tackles** - Appropriate Lifting tools like chains, ropes, slings and belts, D-clamp/shackles and Tandem are to be made available for safe loading and unloading. While unloading, the personnel should be able to lift the entire FG in one single sling (using a higher capacity crane), or in multiples of 5 MT capacity. Packing wood must be provided accordingly so that the loads will be unloaded without any incident. Proper gap must be provided between the loose FGs/ Bundles/ Wooden boxes/ Crates so that slings can be put without any difficulty.
- 3.4 **Packing wood and scantlings** - Appropriate wooden boxes, wooden scantlings and curved blocks are to be made available for proper packing of materials, thus to arrest any physical contact between FGs and damages during transportation.

3.5 **Stacking Order** - Plan the stacking order of the materials beforehand to ensure that they won't shift during transport. Place the heavier and larger items on the bottom, and the lighter and smaller items on top.

3.6 Maximum number of items to be stacked is detailed in the table below

Type of load	LCV	Taurus	FF- normal bed	FF- low bed	SF- long bed	Remarks
Wooden box	20	20	48	NA	NA	Volume
Steel box	20	20	48	NA	NA	Volume
Crate	20	20	48	NA	NA	Volume
Loose items (Steel)	90	160	200	160	80	Weight
Tube bundles	12	16	16	16	NA	Volume
Pipe bundles	NA	NA	16	16	NA	Volume
Loose pipes	9	9	16	16	32	Volume
Panels	3	4	8	8	8	Volume
Coil in crate	NA	NA	1(18 Nos)	1(18 Nos)	1(18 Nos)	Volume

3.7 **Accessibility of materials**- Consider the order in which you'll need to unload the materials and stack them accordingly to make sure the materials you need first are easily accessible.

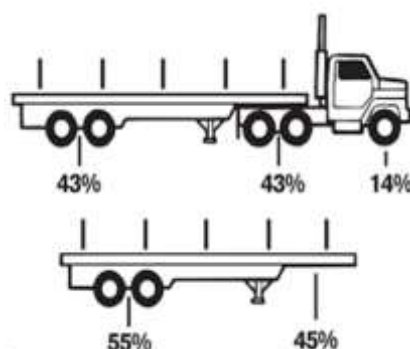
3.8 Maximum limit for number of layers to be loaded is detailed in the table below

Type of load	LCV	Taurus	FF- normal bed	FF- low bed	SF- long bed	Remarks
Wooden box	2(2m)	2(2.2m)	3(2.4 m)	NA	NA	Volume
Steel box	2(2m)	2(2.2m)	3(2.4 m)	NA	NA	Volume
Crate	2(2m)	2(2.2m)	2(2.4 m)	NA	NA	Volume
Loose items (Steel)	3(2m)	3(2.2m)	4(2.4 m)	4(3 m)	4(3 m)	Volume
Tube bundles	3(2m)	3(2.2m)	4(2.4 m)	4(3 m)	4(3 m)	Volume
Pipe bundles	NA	NA	4(2.4 m)	4(3 m)	4(3 m)	Volume
Loose pipes	3(2m)	3(2.2m)	4(2.4 m)	4(3 m)	4(3 m)	Volume
Panels	3(2m)	3(2.2m)	8(2.4 m)	8(3 m)	8(3 m)	Volume
Coil in crate	NA	NA	1(18 Nos)	1(18 Nos)	1(18 Nos)	Volume

3.9 Loose items which are getting loaded must be incorporated with layer by layer lashing so that safe unloading at site shall be ensured. This will be done in such a way that if lashing of one set of FGs is removed for unloading, the other items which are lashed in the vehicle must stay intact and should not fall off the vehicle to the ground, thus maintaining safe unloading activity.

3.10 **Weight distribution**- Weight of the materials must be evenly distributed across the vehicle to prevent overloading on one side or end of the vehicle. This can cause stability issues during transportation, especially when turning or braking.

Fig-1



Enclosed Cargo Carriers (Lorry and Taurus)- An enclosed cargo carrier should be loaded with 60% of the cargo weight in the front half of the carrier, with the heaviest items loaded in the front. Lighter items should be placed near the top and in the rear of the carrier. Material should be packed closely and firmly, and tied down to secure it.

Open Trailers (40ft, 70ft and Low bed)- Open trailers should be loaded heavier in the front of the box – up to 60% of the cargo weight. Loading should be in the same manner as an enclosed cargo carrier, but small items should not be loaded above the height of the sides of trailer box. Use tie-downs to secure the cargo.

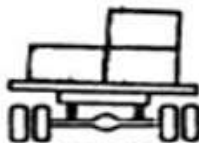
Fig-2

**WRONG**

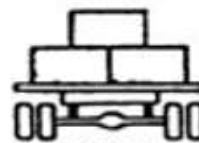
A heavy load, like a big piece of machinery or a safe, should not be loaded against the cab. This loading will bend the frame, perhaps permanently. It will also overload the front tires, may even cause a blowout on a worn tire. Hard steering will also result, and the load may be top-heavy.

**RIGHT**

A heavy concentrated load should be placed near the rear and on its long side if at all possible. Most of the load should be over the rear axle to get proper tire loading and eliminate bending of the frame.

**WRONG**

A very heavy load should not be loaded at one side. This overloads one spring and the tires at that side. This loading could be bad enough to allow the brakes to leak on the wheels at the light side and cause flat spots on the tires, or a skid on a wet surface.

**RIGHT**

This loading has equal loads on the rear tires and eliminates twisting of the frame, which might loosen rivets of cross frame members or frame brackets. Uniform loading crosswise prevents axle housing and wheel bearing overloading, too.

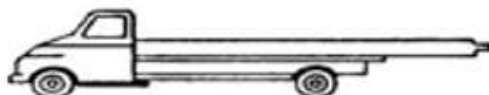
This above example applies to trucks and trailers alike.

**WRONG**

This loading should never be permitted. The frame bends, the rear tires are very much overloaded, and enough weight is taken from the front tires to make steering almost impossible.

**RIGHT**

Again, the proper place for a concentrated load like this is just ahead of the rear axle, with the longest side on the floor.

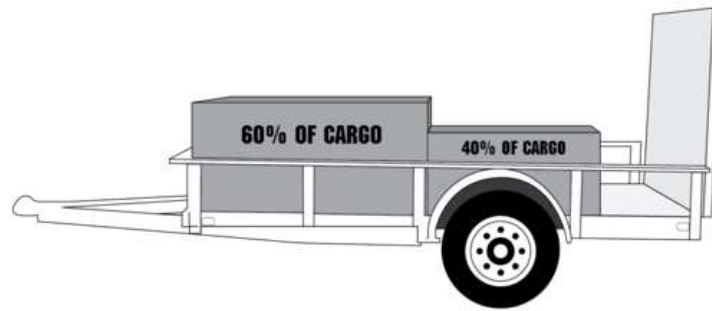
**WRONG**

This type of loading results from the use of the wrong vehicle for the job. Such loading can result, on rough roads, in an actual pivoting of the truck on its rear wheel, and taking the front wheels entirely off the road.

**RIGHT**

A tractor-trailer combination is the proper vehicle for use in service like this. By using the proper vehicle, damage to the truck and tires, and even serious accidents, may be avoided.

Fig-3



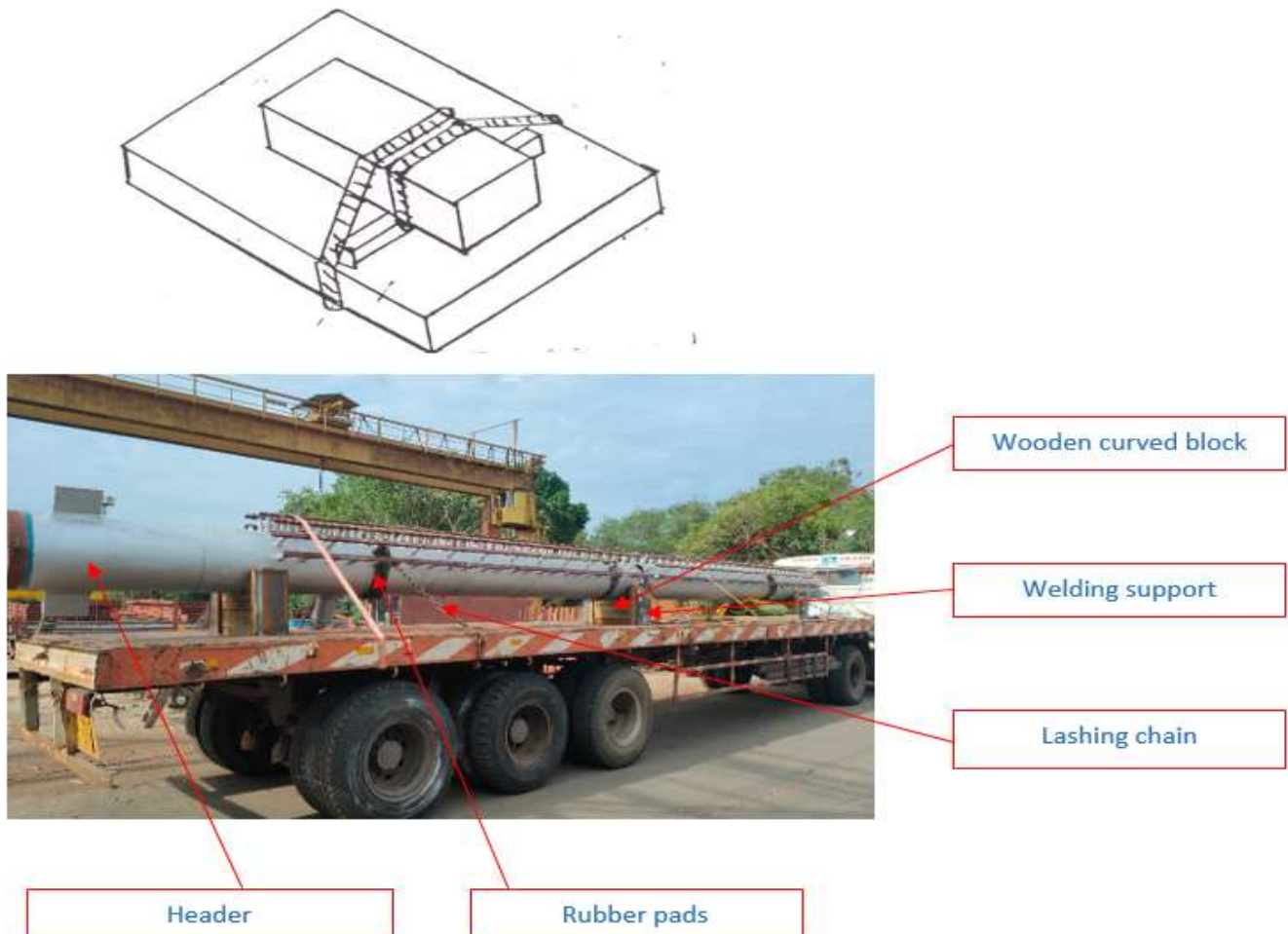
- 3.10 **Securing the materials-** Use ropes, straps, or tie-downs to secure the materials to the vehicle to prevent them from falling or shifting during transport. The purpose of Lashing is to arrest the freedom of movement (moving due to jerks, continual vibrations during shunting of wagons), in all the three directions and hold the component in position during transport by Rail or by Road.

4.0 SPECIFIC INSTRUCTIONS FOR LOADING OF PRESSURE PARTS

- 4.1 As pressure parts are very sensitive to impact load, they have to be loaded and arrested in such a way that all degrees of freedom of movement to be arrested during transit.
- 4.2 After painting, all coils of economizer, superheater, and reheater are to be crated using steel structural with wooden planks are placed between the Coils to avoid damages during transportation and handling.
- 4.3 Appropriate wooden planks of sizes 70mm X 30mm / 70mm X 70mm / 100mm X 100mm are to be stacked between each coils to maintain safe space in order to avoid metal to metal contact during stacking, loading and transit.
- 4.4 Also, wooden planks are to be placed for every 2 metres of the entire length of pressure parts like coils, panels and loose tubes in order provide more rigidity to the loaded materials and proper load distribution.
- 4.5 Height of the consignment
 - 4.5.1 Coils & Panels - Maximum height that can be stacked is 3 metres
 - 4.5.2 Loose Tubes - If loaded in Lorry/Taurus – maximum height is upto 2 metres (in boxes/crates/bundles) and for open trailers, 1.5 metres from the bed of the trailer. If loose tubes are loaded on any other materials in the trailer, maximum height is to be maintained upto 0.5 metres only.
- 4.6 It is preferred to avoid loading of other materials along with headers/vessels
- 4.7 Specific Instructions for the Loading of Headers/Vessels
 - 4.7.1 Measure the length and diameter of the header/vessel to prepare suitable wooden curved blocks/saddles.
 - 4.7.2 Measure the height of the downward-projecting stubs to determine the required height of the curved blocks/saddles.
 - 4.7.3 Place one wooden curved block/saddle on the trailer for every 4 meters of header/vessel length.
 - 4.7.4 Position the header/vessel on the wooden curved blocks/saddles with proper alignment
 - 4.7.5 Ensure that the multiple stubs of the header/vessel are vertically aligned to maintain the correct centre of gravity.

- 4.7.6 Identify lashing points at intervals of 3 meters and fix lashings accordingly
- 4.7.7 Insert rubber pads between the chain lashings and the header/vessel to prevent direct contact and slippage.
- 4.7.8 Apply **basket or ½ hitch lashings** to secure the header/vessel to prevent movement during transit. Sample figure is given below (Fig-4)

Fig-4



5.0 SPECIFIC INSTRUCTIONS FOR LOADING OF VALVES

- 5.1 Suitable boxes will be brought from the stores for the planned Valves/valve parts to be packed during the shift. Before packing, it will be ensured that the boxes are in good condition.
- 5.2 Valves / valve components will be verified physically in line with the details given in the ATs.
- 5.3 Boxes will be marked for sling/lift points, Centre of gravity and Upright orientation.
- 5.4 All smaller valves will be packed in bulk in a box with proper arresting.
- 5.5 For bigger Valves, other than those mentioned in the clause 5.6, packing will be generally in one box along with accessories if any. However, if more than one valve is to be packed in one box it will be ensured that suitable arresting has been provided. Packing shall be done in such a way that, the lateral and upward movements of the valves are arrested by providing wooden scantlings at proper locations.

- 5.6 Packing of export valve will be done in accordance with the despatch Instruction given by Commercial for a given Contract.
- 5.7 Boxes will be loaded on the vehicle as per Fig-1 to Fig-3 ensuring proper weight distribution.
- 5.8 Proper lashing of the boxes to be ensured to prevent any relative movement of the boxes.
- 5.9 When boxes are to be stacked during loading, the box on the top should be placed evenly over the box below so that the weight of the box is distributed over the entire width of the box below.
- 5.10 Shift In-charges will carry out pre-despatch inspections.

6.0 LASHING

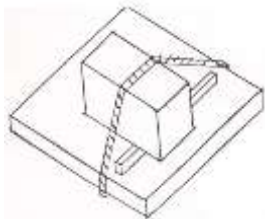
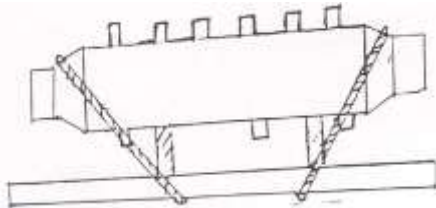
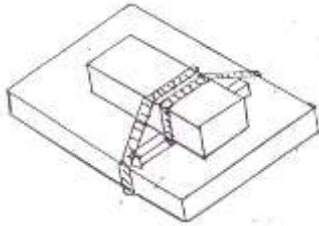
- 6.1 The Ropes and Chains used for Lashing shall be in good condition. The Lashing points shall be in such a way that it will not damage the component. The Lashing Rope/Chains shall come exactly in the support area (Fig-5)
- 6.2 The cylindrical shaped Components like Vessels, Headers, Pipes, etc., shall be placed on curved blocks / wedge shaped supports
- 6.3 The cylindrical shaped Components like Vessels, Headers, Pipes, etc., shall be placed on curved blocks / wedge shaped supports
- 6.4 During lashing, direct contact between the Rope/Chain and Components shall be avoided by providing Rubber Pads and the lashing of crates to be checked before dispatch
- 6.5 Rope tightening shall be ensured using turn buckles / U-clamps
- 6.6 Wooden Boxes and Crates loaded in Lorries are lashed preferably using Ropes only to ensure proper tightening
- 6.7 Wooden planks shall be used for supporting the Components to avoid slippage
- 6.8 Adequate lashing shall be done for each Component/Box/Crate
- 6.9 All Steel Chains / Ropes shall be provided with non-metallic sleeves to avoid metal to metal contact
- 6.10 All side support Pipes shall be provided with Rubber Sleeves

LASHING INSTRUCTIONS

Sl. No	Type of Product (Weight in MT)	Size of Wire Rope (in mm)	Size of Bulldog Clamp (in mm)	Size of Turn Buckle (in mm)	Type and number of Lashing
1	Boiler Drum 112 to 130MT	16	16	20	Pull -2 Basket -4
2	24m Panel 30 to 46MT	16	16	20	Press -2 Basket -3 End press - 2
3	13m Panel up to 20MT	12	12	20	Press -1 Basket -2
4	Bend Panel 12 to 16MT	12	12	20	Basket -4
5	Coils in Crate 18 to 25MT	16	16	20	Press-1 Pull -2
6	Headers 15 to 25MT	16	16	20	Press-3
7	LRSB in Crate	16	16	20	Press-1 Pull -2
8	Down comer Tubes 15 to 20MT	16	16	20	Press-3
9	Gravimetric Tubes 15 to 20MT	16	16	20	Press-3
10	Burner Panel Assembly 15 to 20MT	16	16	20	Press-1 Pull -2

TYPE OF LASHING

Fig-5

PRESS LASHING	
PULL LASHING	
BASKET / ½ HITCH LASHING	

- 6 Proper packaging-** Ensure that the materials are packaged properly and securely to prevent them from shifting or falling during transport.

Sl. No	Name of the items	Bundle	Gunny bag	Wooden Box	Steel box	Steel Crate
1	Steel items <1Kg	10-50	1-100	100-1000	1000-5000	NA
2	Steel structural items	10-50	NA	50-200	100-500	25-100
3	Steel bends	10-25	NA	25-200	100-500	NA
4	Steel pipes (small)	1-10	NA	NA	10-100	10-100
5	Steel tubes (small)	1-10	NA	NA	10-100	10-100
6	Foundation materials	1-10	NA	NA	10-100	10-100
7	Fasteners	NA	1-100	100-1000	1000-5000	NA
8	Valves	NA	NA	1-25	1-25	1
9	Coils	NA	NA	NA	NA	1-18
10	Soot blowers	NA	NA	NA	4-16	4-16
11	Pipes with diameter more than 400mm	NA	NA	NA	NA	10-25
12	Bend tubes	5-25	NA	25-200	100-500	NA
13	Straight tubes	10-50	NA	NA	NA	NA

- 7 **Dunnage-** Use dunnage, such as foam, cardboard, or wood, to fill empty spaces between materials to prevent shifting and damage during transport.
- 8 **Visibility-** Ensure that the driver has clear visibility through the mirrors and that the materials are not blocking any lights, number plates, or indicators.
- 9 **Unloading Equipment-** Ensure that you have the right equipment, such as pallet jack, or forklift, Hydra, EOT, Gantry cranes, to unload the materials safely and efficiently.
- 10 **Height of the load-** Ensure that the height of the load does not exceed the maximum height limit set by regulations. Over-height loads can be a safety hazard and may require additional permits and escorts.
- 11 **Adequate Space-** Ensure that there is enough space in the vehicle to accommodate the materials without overcrowding. Overcrowding can cause the materials to shift and may make it difficult to unload them safely and efficiently.
- 12 **Goose pipes & Wooden scantlings-** Wherever applicable, only nylon belts/rubber sleeved chains should be used for lashing and Goose pipes should be sleeved with rubber, to avoid metal to metal contact.

GOOD LOADING PRACTICES (Fig-7)

1. Proper Stacking of Materials

Ensure that materials are stacked securely and uniformly on the trailer. Heavier items should be placed at the bottom, and lighter materials should be stacked on top. Use tie-downs, straps, or other load-securing methods to prevent shifting during transportation and ensure that the materials are stable and balanced on the trailer. Multi-tire lashing and bundling should be followed. Conduct a thorough inspection of the stacked materials before transport to make sure there are no loose items or unstable stacking practices.

2. Provide Side Support up to Material Height

Provide side supports or barriers that extend to the full height of the material stack. These should be strong enough to contain and secure the load, preventing it from shifting or falling sideways. Ensure the side supports are adjustable or appropriately sized for different types of loads and are regularly checked for stability and wear.

3. Proper Packing and Clearance for Rigging:

Ensure that materials are packed in a way that allows for easy rigging and safe unloading. Provide enough clearance for slings and rigging equipment to be properly positioned and securely attached. Avoid blocking or obstructing areas where rigging needs to be positioned to ensure safe and efficient unloading. Consider using packaging materials (e.g., dunnage, padding) to create a stable base and prevent materials from shifting during transport, while also facilitating easier rigging during unloading.

4. Post loading / Pre-despatch inspection

Ensure the loading compliance with the work instruction by implementing post loading/ pre-despatch inspection. It is recommended to record the photos of the consignment for future references.

By implementing these recommendations, the risk of slippage, instability, and accidents during the lifting and unloading of heavy and large-diameter pipes will be significantly reduced. Proper lugs, lifting beams, and correct loading orientation will ensure that the pipes are securely handled and that workers are protected during the process.

(Fig-7)

Coil CrateLoaded Coil Crate

(Fig-7)

Panel despatch-Past practicePanel despatch- Current practicePanel crating

Loose components of main valve are packed in separate boxes

Movement arresters

Steel base frame

Valves Packing process