



Introduction to Disaster Management

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DISASTER MANAGEMENT

“Disasters are exceptional events which suddenly kill or injure large numbers of people”[Red Cross/Red Crescent](#)

Definition of Disaster : as per DM Act, 2005

“A catastrophe, mishap, calamity or grave occurrence in any area, arising from natural or man made causes, or by accident or negligence which results in substantial loss of life or human suffering or damage to, and destruction of property, or damage to, or degradation of environment and is of such a nature or magnitude as to be beyond the coping capacity of the community of the affected area.”

Disaster as Defined by IR

“Disaster is a serious Train Accident or an Untoward Event of Grave Nature, either on Railway Premises or arising out of Railway Activity in that Area, *due to natural or man made causes*, that may lead to loss of many lives and/or grievous injuries to large number of people; and/or severe disruption of traffic, necessitating large scale help from other Government, Non-Govt., and Private Organisations ”

Accident

- Accident is an occurrence in the course of working of Railway which does or may affect the safety of the railway, its engine, rolling stock, permanent way and works, fixed installations, passengers or servant or which affect the safety of others or which does or may cause delay to train or loss to the railway

Object of Disaster Management

Continuous, Integrated Process of Planning, Organizing, Coordinating and Implementing Measures for:-

- *Prevention of Danger or Threat of Disaster*
- *Mitigation, Reduction of Risk, or its Severity or Consequences*
- *Capacity Building, Preparedness*
- *Prompt Response to any Threat (Disaster)*
- *Assess Severity or Magnitude*
- *Evacuation, Relief and Rescue*
- *Rehabilitation and Reconstruction*

Disaster Management - National Scenario



Heavy Inundation



BREACH

Arial view



Arial view



Disaster Management- National Scene

- Disaster Management Act, 2005 – promulgated in 2005 in Parliament
- MHA (Ministry of Home Affairs)- Nodal Ministry for all Disasters except Drought.
- NDMA (National Disaster Management Authority) constituted under DM Act to deal with DM.
- NDMA also called – NATIONAL AUTHORITY
- GOI Policy to Integrate Resources of Central/State Govts. & NGOs etc. under Common Platform to Handle Disasters
- 24X7 Control Room in DM Division of MHA.
- DM Expertise to be Developed under Different Heads – (Nuclear/Radiological, Biological and Chemical) - NBC and other than NBC.

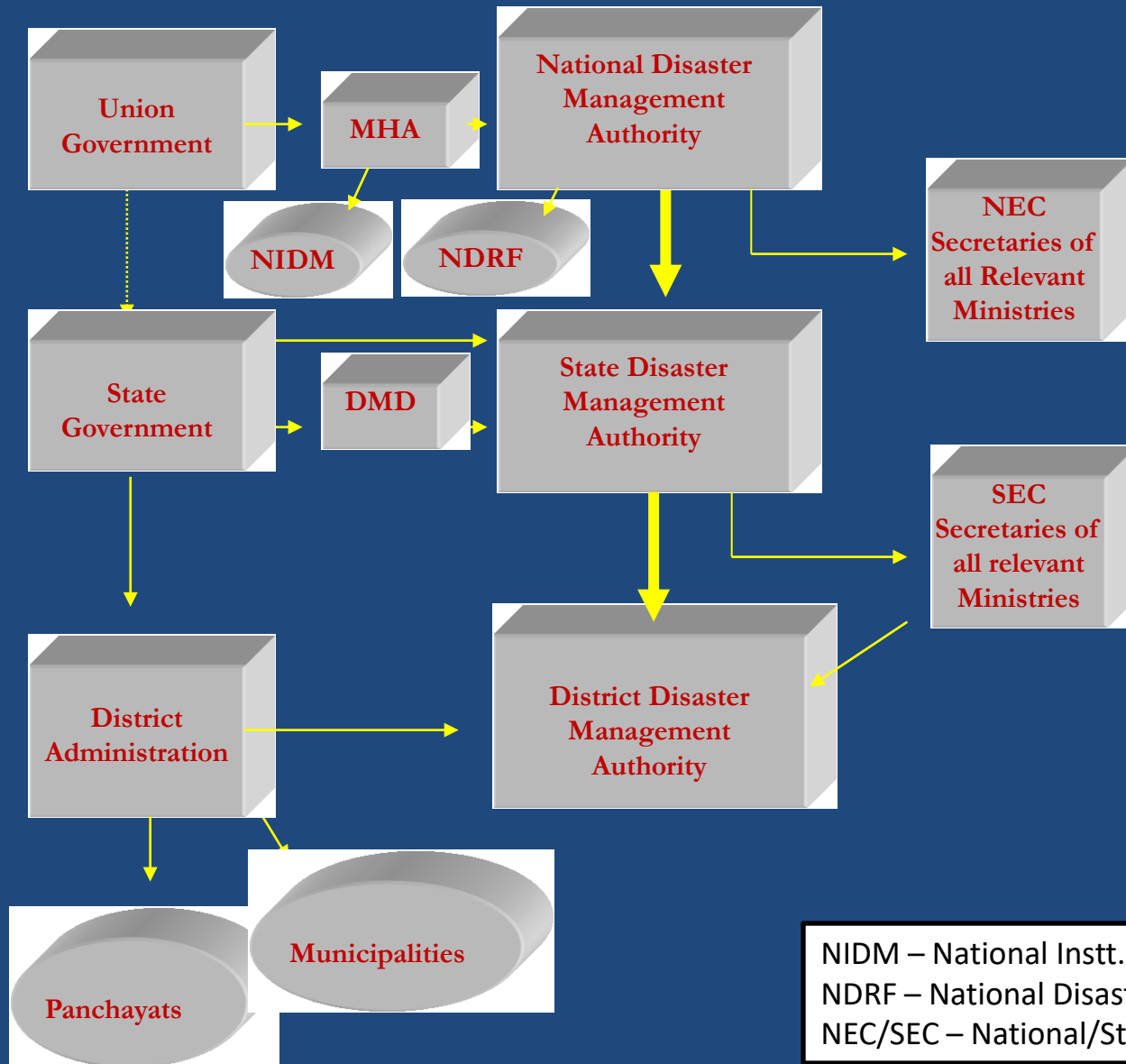
The Disaster Management Act, 2005

It legislates a holistic approach to Disaster Management, not mere Responding to Disasters, but -

- Greater Attention for Prevention & Mitigation, Capacity Building & Preparedness, and
- Pooling of Resources of All Depts, Central & State Govt., NGO's etc.,

Institutional Framework

Under the Disaster Management Act, 2005



NDRF

National Disaster Response Force (NDRF) is a force of 12 battalions, organised on para-military lines, and manned by persons on deputation from the para-military forces of India.

S. No.	NDRF Unit	State	CPF
1	01 Bn NDRF, Guwahati	Assam	BSF
2	02 Bn NDRF, Kolkata	West Bengal	BSF
3	03 Bn NDRF, Cuttack	Odisha	CISF
4	04 Bn NDRF, Arakkonam	Tamil Nadu	CISF
5	05 Bn NDRF, Pune	Maharashtra	CRPF
6	06 Bn NDRF, Gandhinagar	Gujarat	CRPF
7	07 Bn NDRF, Bhatinda	Punjab	ITBP
8	08 Bn NDRF, Ghaziabad	Uttar Pradesh	ITBP
9	09 Bn NDRF, Patna	Bihar	BSF
10	10 Bn NDRF, Vijayawada	Andhra Pradesh	CRPF
11	11 Bn NDRF, Varanasi	Uttar Pradesh	SSB
12	12 Bn NDRF, Itanagar	Arunachal Pradesh	SSB

- The total strength of each battalion is approximately 1149. Each battalion is capable of providing 18 self-contained specialist search and rescue teams of 45 personnel each including engineers, technicians, electrician, dog squads and medical/paramedic.
- NDRF in addition to being able to respond to natural disasters has four battalions capable of responding to radiological, nuclear, biological and chemical disasters

TYPES OF DISASTERS ON IR

Natural:

- Earthquakes
- Heavy Floods/Breaches

Caused:

- Collisions
- Derailments
- Accidents at manned or unmanned level Crossings
- Fire or explosion in trains
- Sabotage
- Other accidents affecting the safety of rail operation

Rear Collision



SPAD case loco derailed at trap point.



A CASE OF SPAD



A CHAOTIC SCENE OF DERAILMENT



Top view of derailed Tank Wagons



*How Disaster/Accident
is communicated?*

Disaster Communication

- First information will be communicated by either of the following:
- Working Train Crew
- Crew of the trains running on the other line
- On Board Staff/Passengers
- Patrolling Staff
- Engineering Gang
- Nearest Station ASM/SM
- Gatemen
- General Public in the surrounding affected areas

Disaster Communication

Further, this Information will be

- received by Section Control/ Division Control from site of disaster
- Division Control will pass on the information to all officials concerned
- Simultaneously, relief and rescue will be ordered
- Information will be communicated to Central Control

First responders

- Instant Action Team – Loco-Pilot / Assistant Loco-Pilot, Guard & other on-board staff
- Volunteers from Surrounding areas
- Nearest Engineering Gang, Station Masters
- Other Departmental Officials
- **DM TEAM** – Nominated officials from various Departments arriving at site by ARMVs and ARTs form part of the DM Team.

Disaster Management on IR

Divisional Level:

- DM Plan at Divisional Level is available clearly indicating the resources available and responsibilities of each department
- Non-Railway resources required to be called in during exigency is also indicated in the DM Plan along-with contact details of important officials like:-
 - List of District Collectors and other officials
 - State Disaster Management authority
 - List of Hospitals and Doctors
 - Equipment hirers
 - Defence Organisations
 - NGOs etc.,

Disaster Management on IR

Zonal Level:

- DM Plan at Zonal Level is available clearly indicating the resources available and responsibilities of each department
- Dedicated Disaster Management Control room is provided and manned by HoDs of all Departments concerned
- Liaison with State & Central Government officials/agencies
- Co-ordination with Other Zones for assistance
- Monitoring rescue arrangements and mobilisation of Men & Machinery
- Regulation of Traffic passing through affected area

ACCIDENT RESCUE & RESTORATION

Main areas of focus :-

- Faster Response
- Relief and Rescue to the Passengers
- Evacuation and Transportation of the passengers
- Better Facilities and Equipments
- Training and Preparedness
- Crack Team of Rail Rescue Experts in Hd Qrs
- Every Division / Rly to have DM Plan
- MOUs & Coordination with Civil Medical Authorities/St. John Ambulance/NGOs
- Self propelled ART/ARME - Three Coach Self Propelled Train for each Division

Disaster Management Resources

- **RESOURCE UNIT – 1** **People (Passengers) on TRAIN, AT SURROUNDINGS, AT ADJOINING STATIONS**
- **RESOURCE UNIT – 2** **ART & ARMV – SCR**
- **RESOURCE UNIT – 3** **ART & ARMV OF ADJOINING ZONES**
- **RESOURCE UNIT – 4** **NON-RAILWAY RESOURCES SUCH AS STATE AUTHORITY, DISTRICT AUTHORITY, PRIVATE HOSPITALS, MILITARY, NGOs.**

Railways Special Strengths to Handle Disasters :-

- During Disaster, Rlys may be asked to Share its Facilities; there will be lesser occasions for Rlys to Demand Outside Help.
- Several Agencies available with Rlys for Prompt Response.
 - On board Staff on Important Trains
 - Frontline Supervisor and Staff
 - Gangmen
 - Civil Defence Team; Scouts
 - RPF/RPSF
 - TA (Territorial Army) Units
 - Its own Communication
 - “Command and Control” System through Optg. Control with all Stations.
 - Medical Infrastructure
 - Water Supply arrangement and Testing Systems
 - Capacity to Mobilize Spl. Trains for Evacuation

Relief and Rescue Equipment with Railways

ARTs (Accident Relief Trains):-

1. 140 T capacity Diesel Hydraulic relief trains
2. Hydraulic Re-Railing Equipment with 120 T capacity Jacks
3. Inflatable Air Bags
4. Portable/fixed Elec. Generators with lighting gear
5. Inflatable Lighting Towers
6. Oxy- Acetylene Cutting Equipment
7. Oxy-Fuel Cutting (Under water cutting Equipment)

Relief and Rescue Equipment with Railways

8. Air Plasma Cutting Equipment

9. Telescopic ladders

10. Communication Equipment including SAT phones

11. Tents and other support equipment

12. Chain saws

Relief and Rescue Equipment with Railways

ARMVs (Accident Relief Medical Vans):

1. Hydraulic Rescue Devices
2. Electrical Rescue Tools with portable generators
3. Abrasive cutting tools
4. Oxy- Acetylene cutting equipment
5. Air Plasma Cutting Equipment
6. Self Contained Breathing Apparatus
7. Lighting equipment including Inflatable Lighting Towers

Relief and Rescue Equipment with Railways

8. Aluminum Telescopic ladders

9. Rope Ladders

10. Safety Harness

11. Inflatable Air Bags

12. Communication Equipment

13. Life Jackets

14. Fully equipped Mini Operation Theater

15. All Emergency medical equipment to stabilize the injured passengers

16. All medicines required to treat the injured & passengers in trauma

17. A well attended medical ward

MAINTENANCE OF RELIEF & RESCUE EQUIPMENT

Having equipment alone does not serve the purpose unless they are maintained in good fettle and available for use 24X 7 as accidents are unpredictable.

1. Dedicated exclusive Maintenance staff from all departments will ensure the equipment in good fettle duly carrying out the periodical schedules and testing them.
2. AMCs with OEMs are in force for Certain critical equipment like – cummins engines on 140 T Cranes and SPARTs, HREs, HRDs and inflatable lighting towers etc.,
3. Trained DSL shed staff is ensuring day to day maintenance of engines, transmission, hydraulics & electronics.
4. Availability of 100% critical spares for maintenance is ensured.

GOLDEN HOUR

If a critical trauma patient is not given definite medical care within one hour from the time of accident, chances of his ultimate recovery reduce drastically, even with the best of medical attention thereafter. This initial one hour period is generally known as “The Golden Hour”.

THINGS TO DO:

- Render definite medical care within Golden Hour.
- Arrest bleeding and restore blood pressure within an hour.
- Persons under shock shall immediately be relieved of shock.
- Transport the casualties to the nearest hospital.

***Duties of Mechanical Officers'
during Disaster***

DUTIES OF MECHANICAL OFFICIAL/OFFICER

- All nominated Break Down special staff shall report to the in charge.
- Ensure marshalling of BD special according to site requirement
- On reaching site, the specially trained CRACK TEAM shall extricate the passengers from the affected coaches in co-ordination with the Medical Team.

- The Officer/s representing Mechanical Department shall assess the requirement of additional Medical Vans / BD Specials and shall liaison with adjoining Railway / Division for ordering the same.
- He shall also monitor the movement of all Relief trains.
- He shall obtain the details of rolling stock involved in the accident.
- They shall obtain the restoration details and record the handling of each and every vehicle including locomotive.

- Inform DRM, ADRM and other Divisional Officers.
- Inform SMs at either end of the block section and Central Control.
- Advise Civil, Military, Private hospitals apart from Railway Hospitals to rush medical aid to the site of accident and to be in preparedness to admit the injured passengers.
- Collect the details of dead and injured and the locations where they are admitted for medical treatment.

General classification of ARTs & ARMVs

Accident Relief Trains (ARTs):

- Class – “A” – Consists of Hydraulic Re-Railing Equipment (HRE) + BD Crane.
- Class – “B” – Consists of HRE only.
- Class – “C” – Consists of Mechanical Tool Van

Accident Relief Medical Vans (ARMVs):

- ARMVs are classified in to Scale “I” and “II”. Scale “I” being mobile and Scale “II” is stationery provided in the stations.

ARTs & ARMVs on Indian Railways

Sl.No	Type & Class of ART/ARMV	Numbers
1	BG 'A' Class ART	66
2	BG 'B' Class ART	68
3	BG 'C' Class ART	11
4	BG SPARTs	13
5	MG 'A' Class ARTs	20
6	MG 'B' Class ARTs	3
7	MG 'C' Class ARTs	1
8	NG 'B' Class ARTs	4
9	NG 'C' Class ARTs	5
10	BG ARMVs	136
11	BG SPMRV	13
12	MG ARMV	21

140 T CRANES



SELF PROPELLED ART



SELF PROPELLED ARMV



Khandwa

MADHYA PRADESH



SOUTH CENTRAL RAILWAY
दक्षिण मध्य रेलवे
SYSTEM MAP मान चित्र
AS ON 31-03-2012

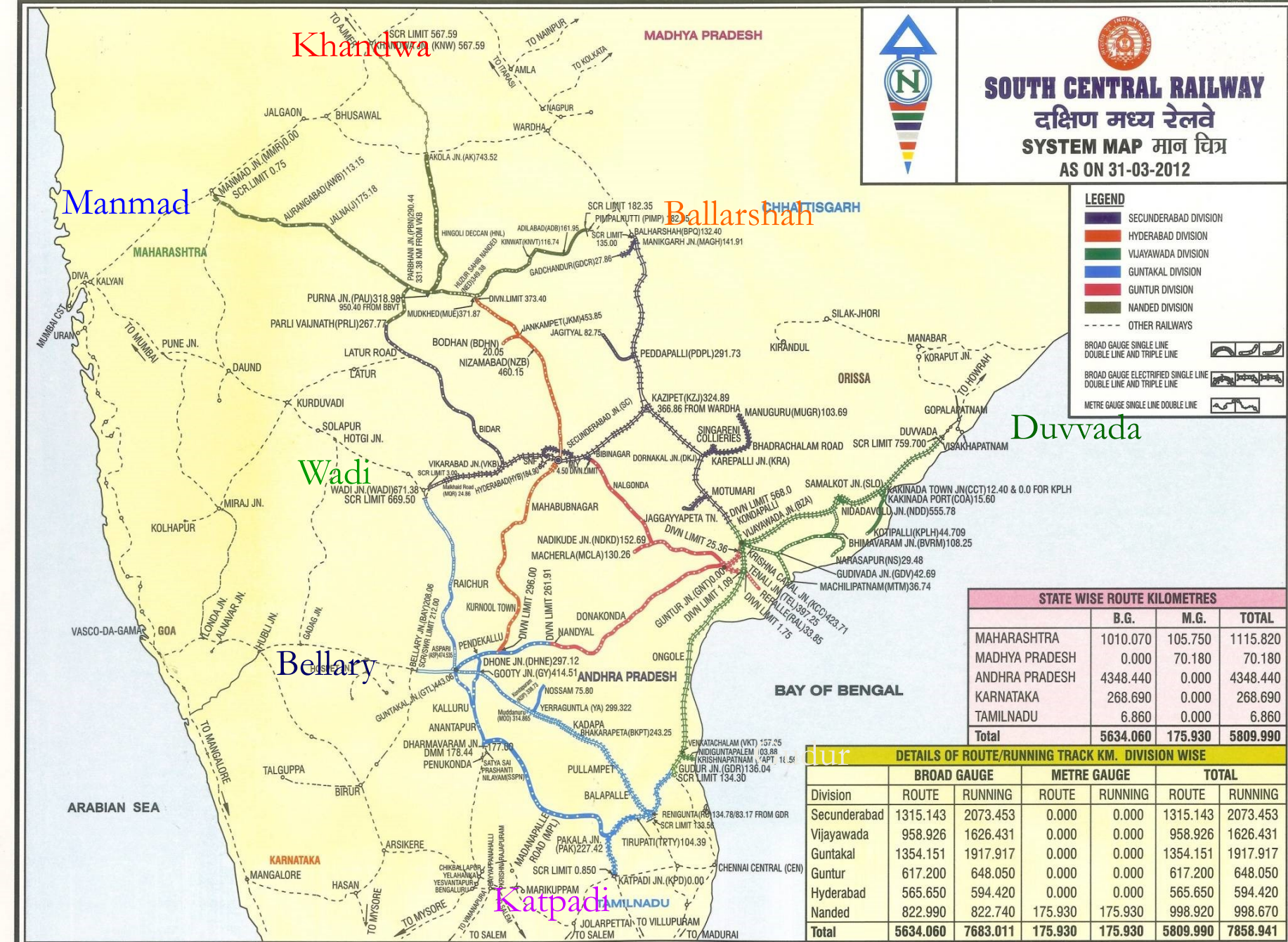
Manmad

Ballerashah

LEGEND

- SECUNDERABAD DIVISION
- HYDERABAD DIVISION
- VIJAYAWADA DIVISION
- GUNTAKAL DIVISION
- GUNTUR DIVISION
- NANNED DIVISION
- OTHER RAILWAYS

- BROAD GAUGE SINGLE LINE
DOUBLE LINE AND TRIPLE LINE
- BROAD GAUGE ELECTRIFIED SINGLE LINE
DOUBLE LINE AND TRIPLE LINE
- METRE GAUGE SINGLE LINE
DOUBLE LINE



Duvvada

Bellary

Katpadi

STATE WISE ROUTE KILOMETRES			
	B.G.	M.G.	TOTAL
MAHARASHTRA	1010.070	105.750	1115.820
MADHYA PRADESH	0.000	70.180	70.180
ANDHRA PRADESH	4348.440	0.000	4348.440
KARNATAKA	268.690	0.000	268.690
TAMILNADU	6.860	0.000	6.860
Total	5634.060	175.930	5809.990

Division	DETAILS OF ROUTE/RUNNING TRACK KM. DIVISION WISE					
	BROAD GAUGE		METRE GAUGE		TOTAL	
	ROUTE	RUNNING	ROUTE	RUNNING	ROUTE	RUNNING
Secunderabad	1315.143	2073.453	0.000	0.000	1315.143	2073.453
Vijayawada	958.926	1626.431	0.000	0.000	958.926	1626.431
Guntakal	1354.151	1917.917	0.000	0.000	1354.151	1917.917
Guntur	617.200	648.050	0.000	0.000	617.200	648.050
Hyderabad	565.650	594.420	0.000	0.000	565.650	594.420
Nanded	822.990	822.740	175.930	175.930	998.920	998.670
Total	5634.060	7683.011	175.930	175.930	5809.990	7858.941

South Central Railway - At a Glance

Route Kilometres	5803 BG :5627 MG :176
States Covered (5)	Andhra Pradesh (4342 Km -75%) , Maharashtra (1115 Km – 19%), Karnataka (268 Km – 5%) , Madhya Pradesh (71 Km – 1%), Tamil Nadu (7 Km – 0.2%)
Divisions (6)	Guntur, Guntakal, Hyderabad, Nanded, Secunderabad, Vijayawada
Stations	699
Originating Passengers	<ul style="list-style-type: none"> • 384 Million (2019-20) • 326.67 Million (2019-20)
Avg. Number of passenger trains run daily (690)	Express : 225 Passenger : 347 MMTS : 118 Local Trains : 59
Avg No of Goods trains run daily	425

BG "A" Class ARTs on SCR

Locations & Type of Equipment.

- 1) SC – Lukas HRE + Cowans New 140 T Crane
- 2) KZJ- MFD HRE + Cowans Old 140 T Crane.
- 3) BZA – Lukas HRE (SPART) + Cowans Old 140T Crane.
- 4) GY - Cowans Old 140 T Crane.
- 5) PAU – MFD HRE + New Gottwald 140 T Crane.

BG "B" Class ARTs on SCR

- 1) SC – MFD HRE in SP-ART
- 2) BPA - LUKAS HRE
- 3) RJY - Lukas HRE
- 4) BTTR - Lukas HRE.
- 5) GTL- Lukas HRE.
- 6) RU - Lukas HRE.
- 7) GNT - Lukas HRE.
- 8) NZB - MFD HRE.
- 9) DMM- MFD HRE
- 10) KZJ – Lukas HRE

INSIDE VIEW OF ART – TOOL VAN



LUKAS HYDRAULIC JACKS



Locations of ARMVs on SCR

- 1) SC – SP-ARMV
- 2) KZJ
- 3) BZA
- 4) RJY
- 5) BTTR
- 6) GTL
- 7) RU
- 8) DMM
- 9) PAU
- 10) NZB
- 11) AK (MG),

HYDRAULIC RESCUE DEVICE IN ARMVs



HYDRAULIC RESCUE TOOLS



CUTTER



SPREADER



RAM



POWERPACK - for operation of tools

Standard Formation of ARTs & ARMVs

ARTs:

1. HRE Van
2. Other Equipment Van (Electrical and S&T)
3. Rest cum Kitchen Van
4. Two Engineering Wagons
5. One OHE Wagon (In Electrified Territories)

ARMVs:

1. Medical Van
2. Auxiliary Mechanical van

Beats of ARTs & ARMVs

As per report on modernisation/re-organisation of ARTs -1986 (known as Acharya Committee)

ARTs:

1. BG – 250 to 300 Kms (Distance between 2 ARTs)
2. MG – 150 to 200 Kms

ARMVs:

Initially ARMVs were placed on need basis. Due to development of outside medical facilities adjoining railway tracks, Board has decided not to proliferate further ARMVs.

Staffing for ARTs & ARMVs

As per report on modernisation/re-organisation of ARTs -1986
(known as Acharya Committee)

ARTs (Mech):

1. Maintenance: 'A' Class -10; 'B' Class – 6;
2. Restoration Gang: 'A' Class – 37; 'B' Class – 28 (including maintenance staff)

(S&T – 2; Elec. -4; Engg. – 2)

ARMVs:

1. Maintenance will be done by ART staff only.
2. Rescue staff: 11

(S&T – 2; Elec. -2)

* More number of staff can be called depending on the gravity of the Disaster for rescue and restoration.






Training of ART & ARMV Staff

1. For 140T Cranes, maintenance training is imparted at POH shops (Parel & Jamalpur)
2. Initial training for crane drivers is imparted at POH shops (Parel & Jamalpur)
3. Refresher training for crane drivers is imparted at KZJ Crane depot
4. All Crane, ART & ARMV staff will be trained in rescue & restoration during periodical technical mock drills.
5. DM training for ARMV staff is imparted at ***National Industrial Security Academy (NISA), Hyderabad***
6. Basic fire fighting training is being imparted at ***AP State Fire Training School, Hyderabad***

Inspection Schedules for ARTs & ARMVs by Officers

Sl.No	Officers'	Schedule
1	Controlling Officer' (JS/SS)	Once in a month all ARTs & ARMVs under his control
2	Controlling Officer (JAG)	Once in a quarter all ARTs & ARMVs under his control
3	Joint Insp.by Divsional Branch Officers' (Mech, S&T, Elec., Engg. & safety)	Once in six months all ARTs & ARMVs over the division
4	Joint Insp. By Supervisors	Once in a month
5	HQ Mechanical Officers (HAG/SAG)	One unit - Once in quarter
6	HQ Mechanical Officers (JAG)	One unit- Once in a quarter
7	Periodical mock drills	Quarterly by Safety branch
8	Periodical technical mock drills	Once in four months
9	In-charge supervisor/maintenance staff	Periodical schedules for the equipment will be carried out on daily/FNly/monthly/ quarterly/ yearly basis

SIREN CODE OF ACCIDENT

- Accident at the Station / Loco Shed where the ART/ARMV is stationed
- **Two long** 
- Accident at out station and mainline is clear
- **Three long** 
- Accident at out station, mainline is clear and ARMV is required
- **Three long – one short** 
- Accident at out station and through running is affected
- **Four long** 
- Accident at out station, through running is affected and ARMV is required
- **Four long – one short** 

NOTE:The duration of the long hooter shall be 45 Seconds and 10 seconds for the short, with half minute (30 seconds) interval between two successive calls.

ART/ARMV TURNING OUT TIME

ART-

During Day - 30 MIN

During Night 45 Min (18.00 Hrs-06.00 Hrs.)

ARMV (DURING DAY AND NIGHT)

Direct Dispatch 15 Min.

In-Direct Dispatch- 20 Min.

Note:- Local conditions apply as per Accident Manual

Real-time DisasterManagement

When Disaster is notified:

- All the concerned departments are alerted and swung into action and take responsibility as defined in DM Plan
- Relief Trains are dispatched with least possible delay with concerned relief and rescue teams
- Medical Relief is arranged from the nearest private/ Government hospitals
- Continuous collection of the information and assessment of the requirements at site
- Reaching to the site

Real-time Disaster Management at site

- Establishment of Help Desk/Assistance Booth – for passengers and their relatives
- Assessment of gravity of the situation
- Search for stranded passengers (in-case passenger train) and immediately arrange for extrication
- Obtain clearance from local police in case of suspected sabotage
- Arrange alternate transportation for the passengers
- Arrange food & water for the passengers
- Arrange communication for the passengers
- List out the injured/deceased passengers
- Plan for restoration

Technological inputs for better rescue & restoration

- Review , rationalization / relocation of ART/ ARMV
- Trained & physically fit staff for ART
- Provision of inflatable tower lighting
- Portable electrically operated cutting and boring tool
- Provision of self contained breathing apparatus

Technological inputs for better rescue & restoration

- Inflatable air bags
- Digital camera, lap top computer, video camera
- Charging facility for cell phones
- Provision of inflatable tents
- Luminescent barrier tapes
- Provision 20 nos plastic chairs

Technological inputs for better rescue & restoration

- Light weight foldable ladders
- Portable rail trolley
- Stand by driver for crane
- AMC for critical components for maintenance
- Items to be procured from approved sources only
- Walkie-talkie and VHF sets

Technological inputs for better rescue & restoration

- Video conferencing facility at site
- HRD training
- Establishment of railway disaster management institute
- Management training film on accidents
- Special training on floods, fire fighting, cyclones, earth quakes, due to explosives

New developments for Rescue & Restoration

1. SS cutting equipment (Hydraulic & Electrical) for the use of coaching stock
2. Air plasma cutting for the use of wagon stock
3. Water mist based fire fighting systems
4. Bulldozers
5. Standard towing equipment to clear the locked axle/RB failed rolling stock in the section
6. Under water cutting equipment

BULDOZER



132 TON INFLATABLE AIR BAG (with air)



UNDER WATER CUTTING EQUIPMENT (Oxy-fuel Cutter)

5 L Cap Tank fills with Petrol, Max Pr develops 200 bar connects to the one end of the gas cutter & the another end connects to Oxygen cylinder



A VIEW OF DERAILED LOCOMOTIVE



**Loco leading side leveled by using MFD
and supported by steel cribs.
Rails Laid to pull the loco from other end.**



LIFTING OF LOCOMOTIVES WITH TWO CRANES



Major Impediments at Derailment spot for quick restoration

1. Both side of the affected location jammed by ART & ARMV specials
2. Adjoining block/stations also blocked by specials resulting no path for movement of locos/reversal
3. Delay in clearing the track & non-availability of loco to create gap between the derailed rolling stock
4. Delay in removal/slewing of OHE for crane working
5. Crane marshalling at the accident spot
6. More intervention from HQ/Divisional officers and control
7. Signalling, piloting and clamping points
8. Too much dwelling on identifying cause than quick restoration (compartmentalization)

*Let us strive for
accident free
train operations*

S.Srikrishna