

South Central Railway

Monsoon Precautions &
Preparedness
2020

Engineering Department

Monsoon Period & Affected Areas

Monsoon Period

- South West Monsoon: 15th June to 15th October
- North East Monsoon: 15th September to 15th January

Affected Areas

<u>Monsoon</u>	<u>Affected Divisions / Areas</u>
South West Monsoon	SC, HYB, NED, GNT divisions BZA division: North of Ongole GTL division: North of Kadapa
North East Monsoon	BZA division: South of Ongole GTL division: South of Kadapa
Both SW & NE Monsoon	BZA division: OGL- ANB section GNT division: DKD – GID section GTL division: HX-BKPT section CCA-DMM section

Monsoon Instructions

1. Monsoon Instructions 2020 issued as **Joint Engineering, Operating & Electrical Circular**
2. **Engineering Standing Order no. 82**: Pre-Monsoon inspection of Bridges and entry in Manuscript registers
3. **Engineering Standing Order no. 83**: Inspection, Maintenance of Bridges, Tunnels and other steel structures
4. **Standard Instructions for Monsoon Patrolling** of Track and watching of vulnerable Locations / Bridges issued by CTE's letter dated 28-05-2020
5. **SCR Blue Book** on Monsoon Instructions – 2003
6. **Relevant Paras of IRPWM & IRBM**
7. **Manual of Instructions** for **RATs & RAWs** issued by State Govt.

Monsoon Reserve Stock

Monsoon Reserve Stock (Stationary & On wheels to be maintained as per the Scale below

<u>Material</u>	<u>SC</u>	<u>HYB</u>	<u>BZA</u>	<u>GNT</u>	<u>GTL</u>	<u>NED</u>
<u>Stationary Stock</u>						
1. Sand (Cum)	16,000	2,750	5,150	4,750	6,150	5,300
2. Boulders (Cum)	3,250	150	3,685	4,050	12,900	525
3. Empty Cement Bags (nos)	16,000	2,300	12,600	6,500	10,500	8,000
4. Tarpaulin sheets (nos)	80	10	130	60	70	15
<u>Stock on Wheels</u>						
1. Sand (Wagons)	10 (KZJ)	-	10 (KCC)	-	10 (RU)	7 (PAU)
2. Boulders (Wagons)	10 (KZJ)	-	10 (KCC)	-	10 (RU)	5 (PAU)
3. RH Girders (Sets)	2 (KZJ)	-	2 (KCC)	-	2 (RU)	2 (PAU)
4. Steel Cribs (nos)	50 (KZJ)	-	50 (KCC)	-	50 (RU)	50 (PAU)
5. NP4 Pipes (nos)*	20 (KZJ)	-	20 (KCC)	-	20 (RU)	20 (PAU)

*New addition to the stock as per Hqrs letter dt. 17-06-2020

All Divisions confirmed availability of Reserve stock as per the above scale except NP4 pipes.

NP4 pipes procured by BZA division. Other divisions to comply

Pre Monsoon Inspection of Bridges (ESO 82, 83 & IRBM)

1. **Pre-monsoon** inspection by SSE/P.way and SSE/Works. Details of Inspection & attention to be entered in **Manuscript Registers**
2. **Certificate** to ADEN before 15th June (SW monsoon) and 15th Sept. (NE monsoon)
3. Items of **inspection** for **SSE/P.way**
 - Clearance of **waterway**
 - **Track** on Bridges incl. all types of **sleepers & fittings**
 - **Guard Rails**, Re-railing **ramps**, **Gangways** and their fittings
 - **Flood level** gauge, Marking **HFL, DL**
 - Major **repairs** in steel trolley / man **refuges / gangways** to be advised to SSE/Br.
4. Items of **inspection** for **SSE/Works**
 - **Foundations, Sub-structures, Bed Blocks** of all bridges
 - **Flooring, River training & Protective works**
 - **Superstructure** of all bridges excluding Steel / PSC/ Composite girders
 - **General condition** of superstructure & bearings of all **other bridges**
 - Bridge Appurtenances: Notice Boards, Name Boards, **RCC – Trolley/Man refuges & Pathways**

Pre Monsoon Inspection – Cuttings





1. **Cuttings: Pre-monsoon** inspection to be carried out by **ADEN** and details to be entered in **Cutting Inspection Register**
2. During spells of **Heavy Rains**, ADEN & SSE/P.way to inspect **vulnerable cuttings** by Trolley / Foot plate
3. **Vulnerable cuttings**: once in **3 years**, Sr.DEN to review & identify Vulnerable cuttings. **Watchman** required to be posted during monsoon at these cuttings.
4. **Items to be inspected**
 - Cuttings < 5m height
 1. To be inspected thoroughly by walking over them
 2. Identified **loose boulders** to be removed before monsoon
 - Cuttings 5m to 10m height
 1. Inspection of **Cracks, Fractures, Joints** etc., on cutting face using Binoculars
 - Cuttings > 10m height
 1. Condition of slopes, signs of any **upheaval**.
 2. Condition of **catch water & Side drains** and **outfall** – to be cleared
 3. Condition of **protective works** such as **Retaining walls, Boulder nets** etc.
 4. Trained **Rock climbers** to be employed for inaccessible slopes

Pre Monsoon Inspection – Tunnels

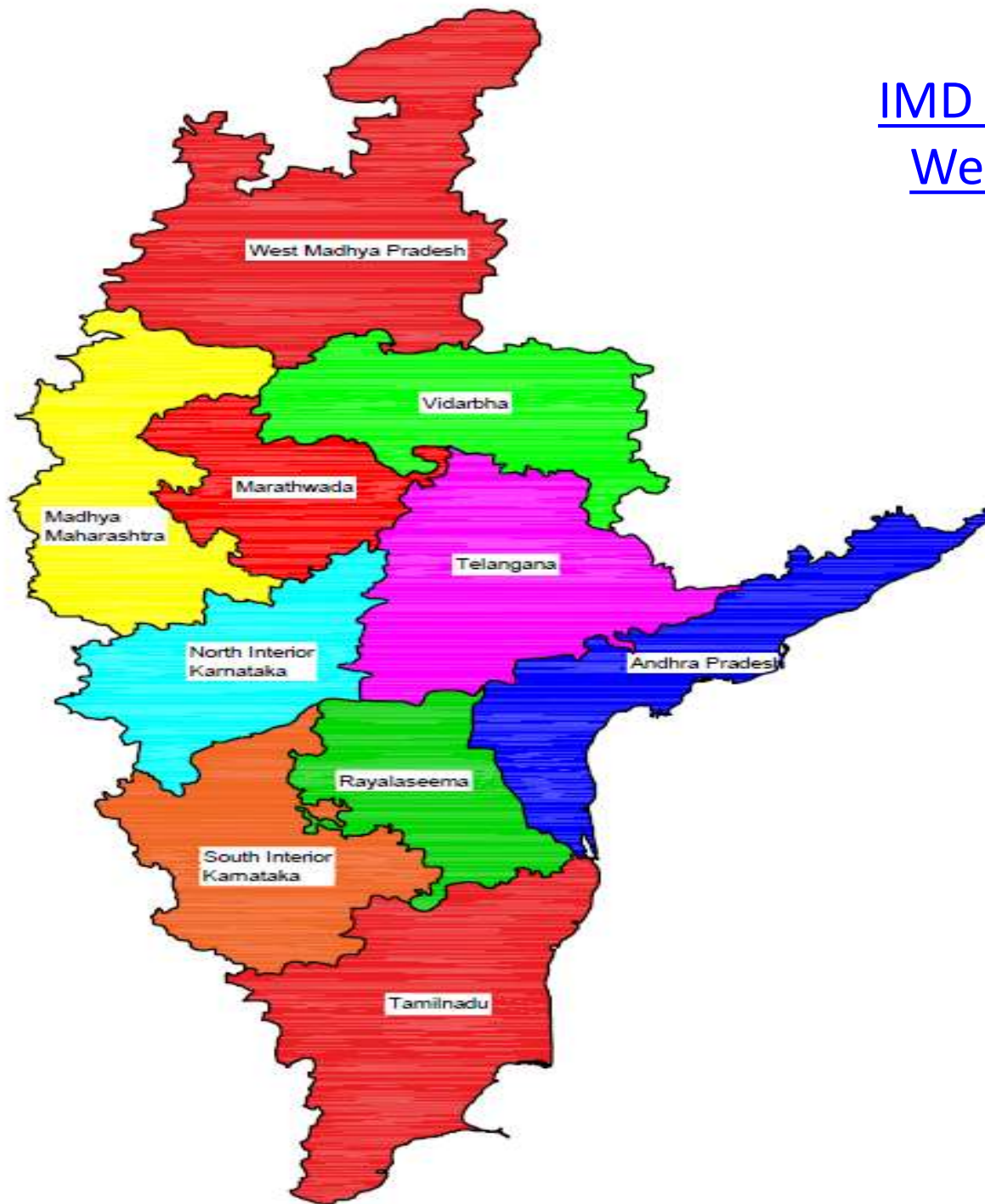
1. **Tunnels: Pre-monsoon** inspection to be carried out by **ADEN** and details to be entered in **Tunnel Inspection Register**
2. **Items to be inspected**
 - **Tunnel approach & Cutting**
 - **Loose boulders** – to be marked and felled
 - **Side drains, outfall** – to be cleared for unobstructed drainage
 - **Condition of end Portals –**
 - Signs of **slips** above portals,
 - condition of **catch water** drains,
 - **loose boulders** over Portals
 - **Tunnel walls & Roofing:**
 - **Seepage** of water, **weep holes**
 - **Cracks** in lining etc.
 - **Drainage inside Tunnel and Outfall**
 - Tunnel **Refuges** & Ventilation shafts
 - **Track in the tunnel**
 - **Lighting** equipment

Weather Warnings

- 1. Weather Warnings** – Issue & Dissemination procedure is given in detail under Para 6 & 7 of Joint Engg., Optg., Elect., circular 2020. (Rainfall > 5cm in 24 hrs, Wind velocity > 65kmph)
- 2. IMD website:** mausam.imd.gov.in
- 3. 5 day forecast & Nowcast** (Hourly forecast for next 3 hours)
- 4. Sub-Division wise & District wise forecast**
- 5. IMD Sub-Divisions in SCR:** 1.Coastal Andhra Pradesh, 2.Rayalaseema, 3.Telangana, 4.South Interior Karnataka, 5.North Interior Karnataka, 6.Madhya Maharashtra 7.Marathwada, 8.Vidarbha, 9.West Madhya Pradesh, 10.Tamilnadu
- 6. Warnings:**

'No Warning'	
'Watch'	
'Alert'	
'Warning'	
- 7. Details of Warning:** Thunderstorm & Lightning, Squall, Strong surface winds, Light rain, Moderate rain, Heavy rain etc.

IMD Sub-Divisions for Weather Warnings



Monsoon Patrolling – Action by Engg. officials

1. **Monsoon Patrolling** to be introduced in the Identified sections for the periods as specified in **CTE's Circular** dated 28-05-2020
2. **Stationary Watchman** to be provided at identified Vulnerable Bridges / Locations as per the CTE circular. Approaches of **newly constructed bridges** should be considered vulnerable and watched.
3. Issue of **Patrol Charts** to be ensured by SrDEN/DENs
4. **Patrol Books** along with Equipment, **Protective clothing**, consumables etc., to be supplied to Patrolmen by SSE/P.Way
5. **Gang patrolling** to be introduced during abnormal Rainfall / storm on receipt of **weather warning** – up to **48 hrs** beyond warning period
6. **Check of Monsoon Patrolling** by Engineering officials:
 - SSE/P.way: Once a fortnight by Train & by Trolley
 - ADEN : Once a month by Train / PT / MT

Monsoon Patrolling – Vulnerable Locations / Bridges

1. All **vulnerable locations / bridges** to be watched **round the clock**
2. **‘C’ & ‘T’ boards** to be fixed for vulnerable locations / bridges
3. Vulnerable locations / bridges **within 200m – Single watchman** can be posted
4. Vulnerable locations to be **reviewed** jointly by **ADEN & DEN** based on past history and pre-monsoon inspections
5. **Deleted locations** – to be marked in **patrol charts** and watched by patrolmen during regular patrolling
6. **Block section** vulnerable purely on account of vulnerable locations / bridges – **stationary watchman** instead of patrolling is permitted
7. **Jungle areas or ghat sections** – Patrolling in **pairs**
8. Use of **GPS trackers** for monitoring the patrolling
9. **Seminars** to spread instructions – Division / Sub-division/ P.way unit

List of Vulnerable Bridges & Locations

<u>Division</u>	<u>No. of Bridges</u>	<u>No. of Locations</u>
SC	251	23
BZA	210	11
GTL	199	26
HYB	172	09
GNT	28	06
NED	54	11
TOTAL	914	86

Railway Affecting Tanks (RATs)

<u>Division</u>	<u>No. of RATs</u>	<u>Inspection done</u>	<u>Repairs identified</u>
SC	672	672	117
BZA	381	381	125
GTL	433	433	66
HYB	261	261	1
GNT	104	104	37
NED	42	40*	0
TOTAL	1893	1891	346

*2 nos on Akola-Khandwa not done as section is closed for traffic

Railway Affecting Tanks (RATs) - Identification

1. **Manual of Instructions** on RAT/RAW issued by each State Govt. Identification, Inspection, Repairs etc., of RATs to be done as per the Manual. (Copies placed on SCR website for downloading)
2. **Identification of RATs (AP & TS)**
 - Tanks within **0.4 km** of track (u/s) irrespective of capacity
 - Tanks within **8 km** of track (u/s) with capacity **0.05 M.cum** or more
 - Tanks within **8-32 km** of track (u/s) with capacity **0.14-3.0 M.cum**
 - Any other tank (u/s) having **past history of breaches** affecting Rly line
 - On D/S of track where **FSL of tank** touches Rly embankments
 - Tank / **series of tanks** in the catchment of a stream crossing Rly track having catchment area not less than 5% of stream catchment area
 - Rly line **passing through a tank**
 1. Where bank likely to be affected due to sudden **drawdown**
 2. Crest level of **surplus weir** above **DL** of the Rly bridge

Railway Affecting Tanks (RATs) - Inspection

1. List of **RATs** will be **updated** by CE/Minor Irrigation **every year** before monsoon and will be intimated to Railway
2. **District Co-ordination Committee** to meet **twice** a year for review / follow up action on Repairs to RATs. Rly Engineers of Divisions are members of this committee – to attend these meetings without fail.
3. Joint **Inspection** of RATs should be carried out without fail **before monsoon** so that adequate time is available for attending to the repairs of the tanks.
4. **Irrigation / Panchayat Raj deptt.** owning the tanks are **responsible** for **prompt repairs** to the RATs
5. **Rly Engineers** have **access** to inspect the RAT repairs undertaken by State authorities. Any **direction** given by **Rly officials** should be **complied** by State authorities.
6. If **important repairs** are not carried out promptly, **Rly can undertake** such repairs at the charge of State Govt.

Railway Affecting Works (RAWs)

1. **Canals & Drainage channels** crossing track with discharge > 1.5 cumecs and **FSL $> 0.3\text{m}$** above Ground level
2. Channels Flowing **towards** or **parallel** to Rly track
 - 5 to 15 cumecs up to 0.5 km
 - 15 to 30 cumecs up to 1.0 km
 - > 30 cumecs up to 1.5 km (even if flowing away from track)
3. **Road Embankments** within **0.8 km** of Rly line and higher than Rly line by 3m with bridges, culverts.
4. **Marginal bunds** of the river crossing the Rly line
5. **Bunds** or works for **diverting the flow** on a river crossing the Rly line.
6. **Dams, Barriages** and **weirs** on the D/S of Rly line having **MWL** higher than the **DL of the bridge**.
7. Procedure for **RAWs inspection** is same as that of RATs

RAT & RAW – Powers of Central Govt. (IR Act, 1989)

The **Central Govt.** may if it is of the opinion that any work across, under, over or near a Railway is likely to **alter or impede the natural course of water flow** thereby **endangering any cutting, embankment or other work** on a Railway, **issue directions** in writing to any person, officer or authority responsible for such work directing such person, officer or authority **to close, prohibit or regulate that work.**

Monsoon Precautions – High Banks / Bad banks

1. High Banks made with Clayey / Silty soils to be watched for Slope failure and Subsidence
2. **Known Bad Locations:** Frequent check of **Cross levels**. Prompt imposition of **CO** in case of abnormal variation.
3. **Sub bank** with **earth** or **sand bags** support at the **Toe** in case of any sign of slippage
4. Ensure good outlet for **central drain** of **Double line** banks
5. Attend to **damaged pitching, ruts** on the bank slopes.
6. Attend to **damaged Toe walls**, Choked up **weep holes** in retaining walls.
7. **New Banks** and **approaches** of newly constructed **Bridges, RUBs** to be watched for settlement.

Monsoon Precautions – Work Execution

1. **No excavation** work adjacent to the bank should be allowed without Proper **support to the Toe and Bank** (sheet piling, secant piling etc., of adequate depth) and a **Caution Order**
2. **Do not permit any work affecting existing bridges without**
 - Approved **GAD**
 - **CRS** Sanction
 - Approved **methodology** of excavation & Bank support
 - **Caution Order**
3. **Do not insert RH girder** into the track during monsoon unless there is firm support (Rock or hard moorum) for crib staging
4. Permit **BOX pushing** operation only **under block**. Allow the traffic after block only after attention & measurement of track parameters
5. **Backfill** behind **abutments** and **retaining walls** should only be with **granular soil** (GW, GP, SW) conforming to IS:1498. **GSB** material conforms to this specification.

Monsoon Precautions - Important Items

1. Monsoon Reserve **stock on wheels** – Wagons should not be moved from nominated stabling station without authority
2. **Reserve stock** to be **recouped** immediately as and when consumed. Bags should be **stitched** after filling with sand.
3. **Locations** of anticipated falling of trees : Cutting of trees & pruning of Branches to be done
4. **Anemometers** – 30 nos fixed at nominated stations to be checked and **repairs** to be attended promptly. Review of **redundant** locations.
5. Close **liaison** with **local Irrigation authorities** regarding Railway affecting tanks, Discharge from Major Dams / Reservoirs
<http://irrigationap.cgg.gov.in/wrd/dashBoard>
6. **RUBs & LHS** locations : **Pumping** arrangements at identified locations to clear stagnation
7. Clearing of **drains in Yards** to prevent Flooding & Track circuit failures

Thank You