

EMERGENCY PREPAREDNESS AND EXCLUSION ZONE REQUIREMENTS FOR INDIAN NPPs

S.S.BAJAJ

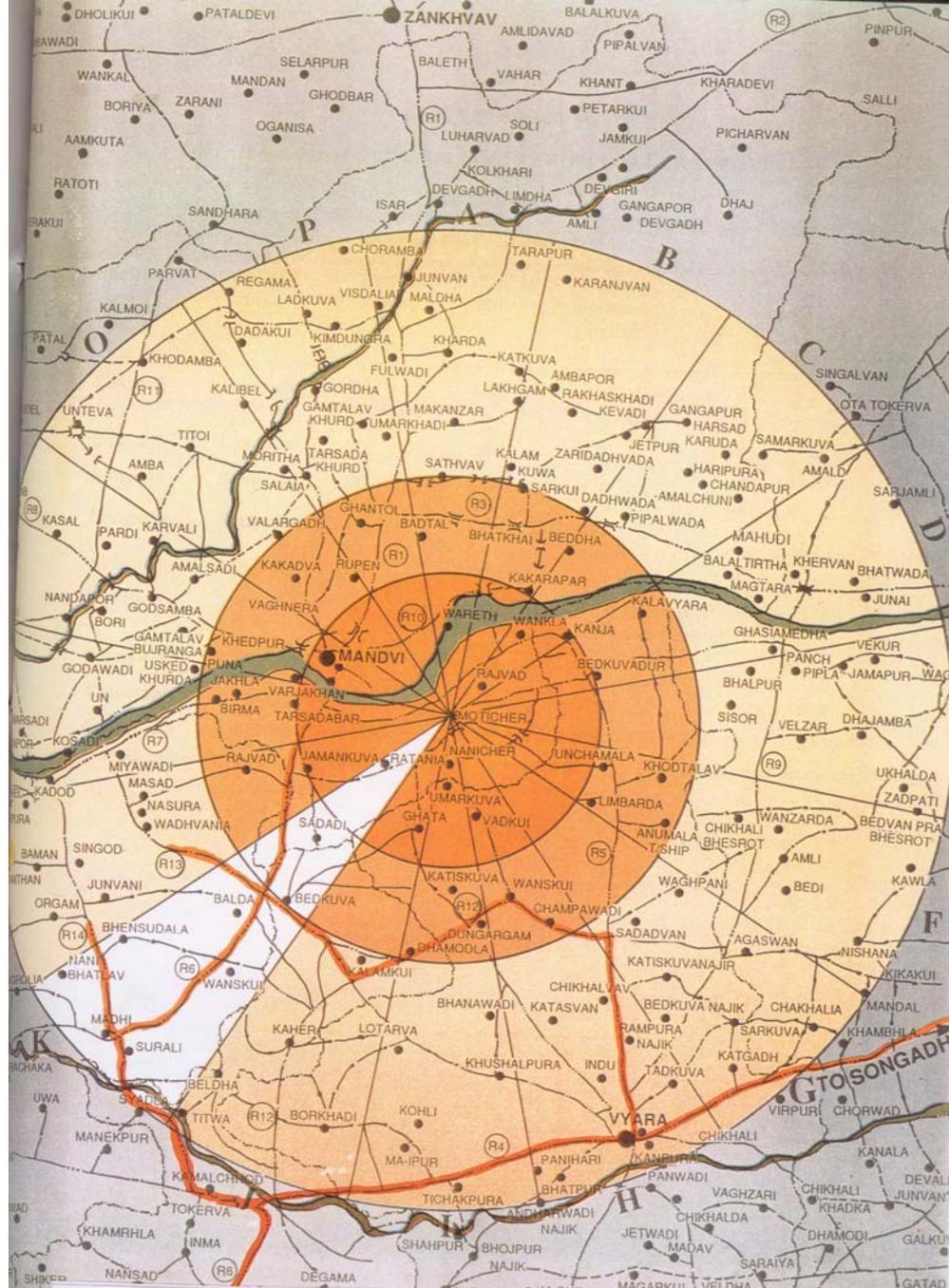
**AERB-USNRC DISCUSSION MEET, WASHINGTON, SEPTEMBER
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PROTECTION OF PUBLIC IN EVENT OF MAJOR ACCIDENTS IN NPPs, PROVIDED THROUGH:

- ZONING AROUND NPPs
- PREPAREDNESS FOR EMERGENCY
COUNTERMEASURES IN PUBLIC DOMAIN

ZONES:

- **EXCLUSION ZONE : 1.5KM/1.6 KM**
- **`STERILIZED' ZONE : 5 KM**
(CONTROLLED POPULATION ZONE)
- **EMERGENCY PLANNING ZONE : 16KM**
 - ✓ **PRIMARY : 8KM**
 - ✓ **SECONDARY : 16 KM****(16 SECTORS)**
- **ENVIRONMENTAL SURVEY ZONE : 30 KM**



EVACUATION ROUTE MAP OF SECTOR - K

REQUIREMENTS FOR EMERGENCY PREPAREDNESS

AERB GUIDE AERB/SG/EP-1, EP-2

- **PLANS TO BE IN PLACE BEFORE NPP OPERATION IS LICENSED.**
- **CATEGORIES OF EMERGENCIES:**
 - ✓ **EMERGENCY ALERT**
 - ✓ **PLANT EMERGENCY : TYPE A,B**
 - ✓ **SITE EMERGENCY**
 - ✓ **OFF-SITE EMERGENCY –PLAN 1, PLAN 2, PLAN 3**
- **OFFSITE EMERGENCY HANDLED BY STATE AUTHORITIES WITH TECHNICAL INPUT FROM OPERATING ORGANISATION**

OBJECTIVES OF EMERGENCY INTERVENTION

FORM, SCALE AND DURATION OF INTERVENTION SHOULD BE OPTIMISED:

- AVOID SERIOUS NON-STOCHASTIC EFFECTS (DOSE < THRESHOLD)
- LIMIT STOCHASTIC RISKS (NET POSITIVE BENEFIT TO INDIVIDUAL)
- LIMIT OVERALL INCIDENCE OF STOCHASTIC EFFECTS (COLLECTIVE DOSE –ALARA)

INTERVENTION LEVELS (IL) FOR COUNTERMEASURES DEFINED FOR THREE SPACE-TIME DOMAINS:

*(DOMAINS OF DECREASING ORDER OF
RADIOLOGICAL SEVERITY)*

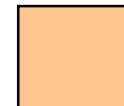
DIST → TIME	NEAR FIELD (A1)	INT. FIELD (A3)	FAR FIELD (A3)
EARLY PHASE (B1)	D1	D2	D3
INT. PHASE (B2)			
LATE PHASE (B3)			



DOMAIN 1



DOMAIN 2



DOMAIN 3

INTERVENTION LEVELS

DOMAIN	MAJOR PATHWAY	OBJECTIVE OF COUNTER MEASURES	COUNTER-MEASURE	IL mSv	
				WB	THYROID
1	INHALATION EXT.GAMMA	AVOID SERIOUS NON-STOCHASTIC EFFECT TO INDIVIDUAL	IODINE PROPH. SHELTER EVACUATE	20/100 100/500	500/2500
2	INGESTION	LIMIT STOCHASTIC RISK TO INDIVIDUAL	IODINE PROPH. SHELTER CONTROL FOOD	5/20 5/20	50/500
3	INGESTION	MINIMISE OVERALL INCIDENCE OF STOCHASTIC EFFECTS	CONTROL FOOD	1/5	

USE OF INTERVENTION LEVELS

- **IF ASSESSED RELEASE AND MEASUREMENTS CONFIRM THAT LOWER IL IN A DOMAIN IS NOT LIKELY TO BE EXCEEDED, THE RELEVANT COUNTERMEASURE MAY NOT BE INITIATED.**
- **IF LOWER IL IS LIKELY TO BE EXCEEDED, INITIATE & COMPLETE THE COUNTERMEASURE SUCH THAT UPPER IL IS NOT EXCEEDED.**

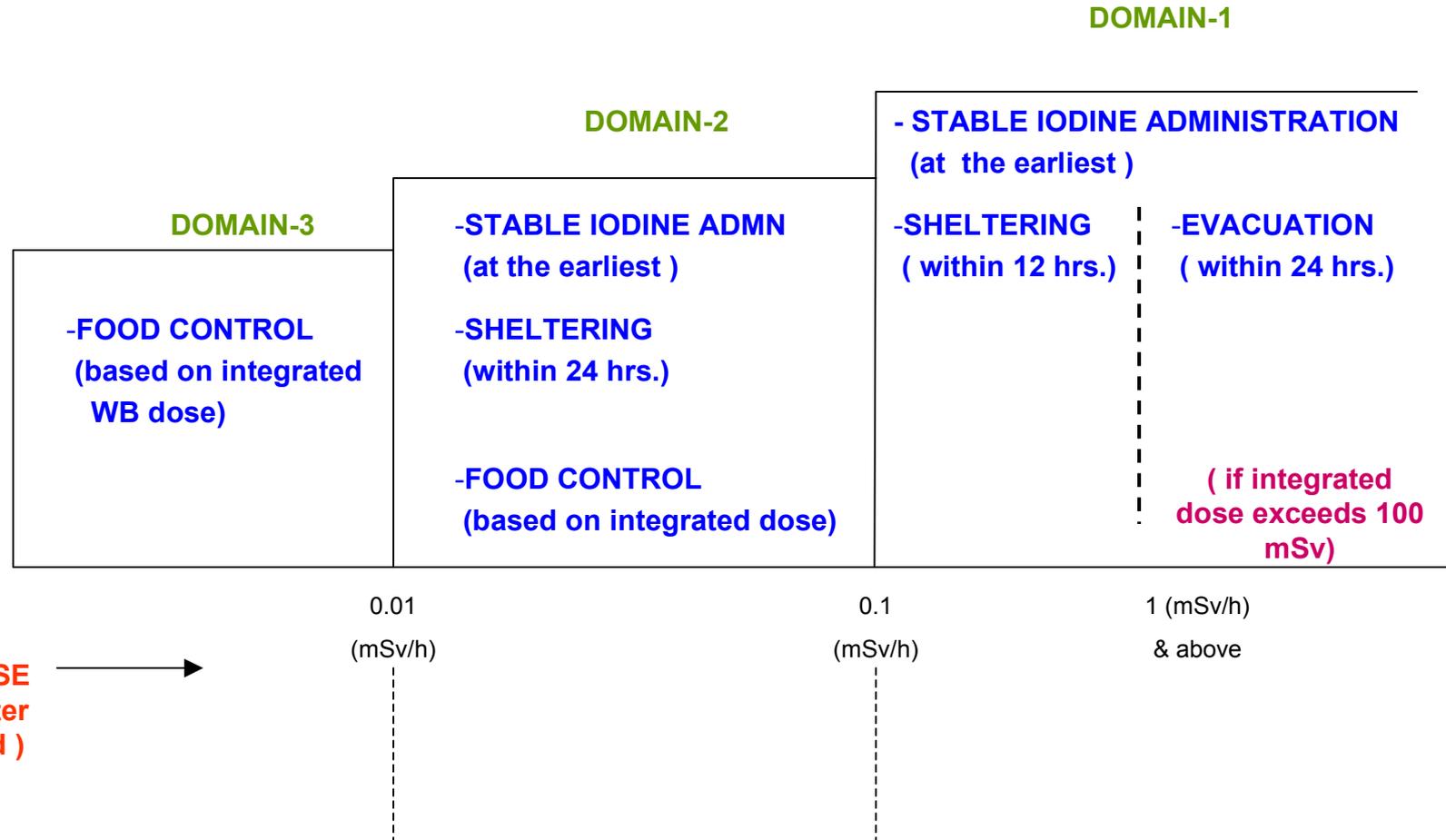
DERIVED INTERVENTION LEVELS(DILS)

(DILS HELP DECIDE DOMAIN & COUNTER MEASURES)

- EXTERNAL GAMMA DOSE RATE AT 1m ABOVE GROUND
- ACTIVITY CONCENTRATION IN FOODSTUFF & WATER

DOMAIN	COUNTER-MEASURE	DIL DOSE RATE 1m ABOVE GR (mSv/hr)	PERIOD OF PERSISTENCE (HRS)	COMPLETION PERIOD (HRS)
1	ADM.STABLE IODINE SHELTER EVACUATE	> 0.1 0.1 – 2 1 - 3	- 4 10	12 24
2	ADM.STABLE IODINE SHELTER CONTROL OF FOODSTUFF	>0.01 0.01 – 0.1 ACT.CONC IN FOODSTUFF	- 10	24 >24 HRS
3	CONTROL OF FOODSTUFF	ACT. CONC. IN FOODSTUFF		>24 HRS

COUNTERMEASURES TO BE IMPLEMENTED AT DIFFERENT GROUND GAMMA DOSE RATE IN THE OFF SITE AREAS



SYSTEM OF INITIAL NOTIFICATION & OFFSITE RESPONSE (CONTD.)

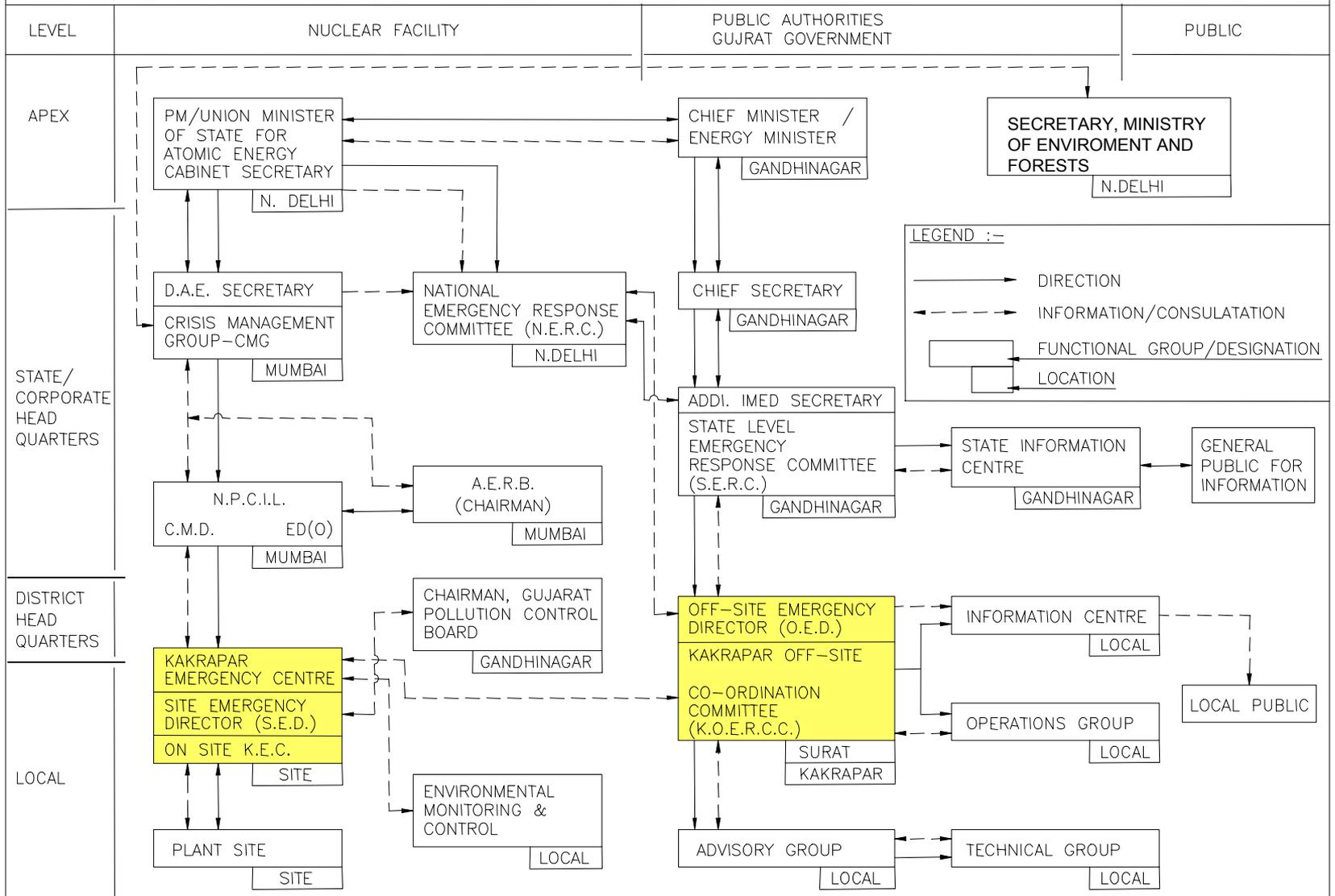
EMERGENCY TYPE (NOTIFICATION BY PLANT AUTHORITIES)	PLANT CONDITION EXAMPLES	PROJECTED DOSES/ INTERVENTION LEVELS	INITIAL OFF-SITE RESPONSE BY PUBLIC AUTHORITIES
SITE EMERGENCY	SUBSTANTIAL MALFUNCTION OF PROCESS & SAFETY SYSTEM (CONTAINMENT SYSTEM INTACT)		EMERGENCY ORGANISATION ON STANDBY
OFF-SITE EMERGENCY • SHELTERING • SHELTERING & THYROID BLOCKING • EVACUATION	SUBSTANTIAL MALFUNCTION OF PROCESS SYSTEM, SAFETY SYSTEM & CONTT SYSTEM	AS PER IL GUIDELINES	EMERGENCY ORGANISATION ACTIVATED TO IMPLEMENT PROTECTIVE MEASURES

OFFSITE EMERGENCY PREPAREDNESS

RESPONSIBILITIES OF PUBLIC AUTHORITIES

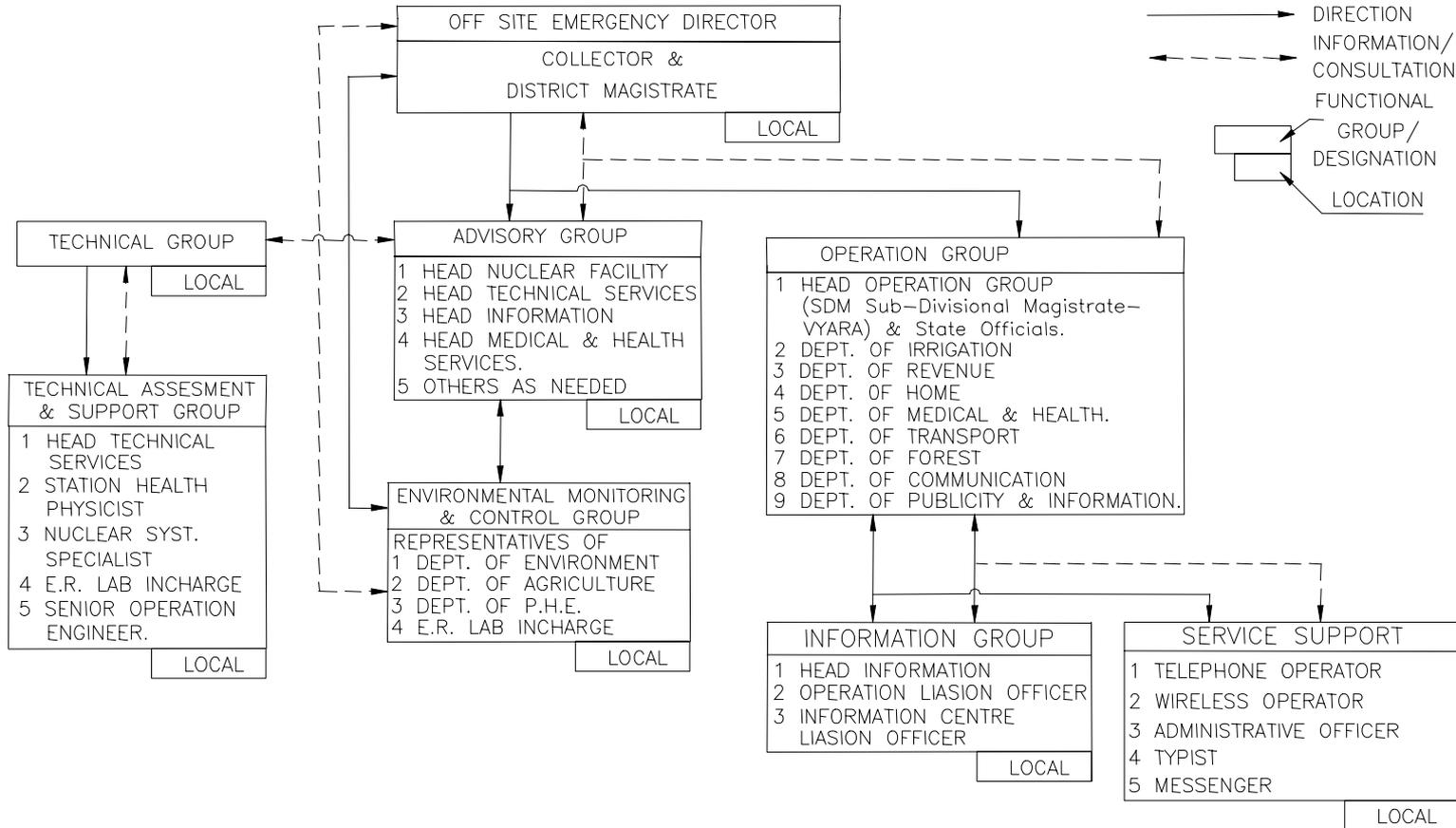
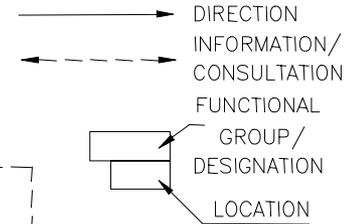
- ASSISTING PLANT AUTHORITIES FOR ENVIRONMENTAL MONITORINGS/ASSAYS OF FOOD SAMPLES
- NOTIFYING/ADVISING AFFECTED POPULATION REGARDING REQUIRED ACTIONS
- SHELTERING
- DISTRIBUTION OF STABLE IODINE
- EVACUATION – ARRANGING TRANSPORT, SUPPLIES OF FOOD & ESSENTIALS
- REHABILITATION
- ENFORCING ACCESS CONTROL TO AFFECTED AREAS
- IMPOUNDING OF CONTAMINATED FOOD STUFF
- ENFORCING LAW & ORDER/SECURITY/TRAFFIC CONTROL MEDICAL CARE
- LIVESTOCK MANAGEMENT
- COMMUNICATIONS
- PUBLIC INFORMATION.

NUCLEAR OFF SITE EMERGENCY MANAGEMENT ORGANISATION (BASIC CONCEPT)

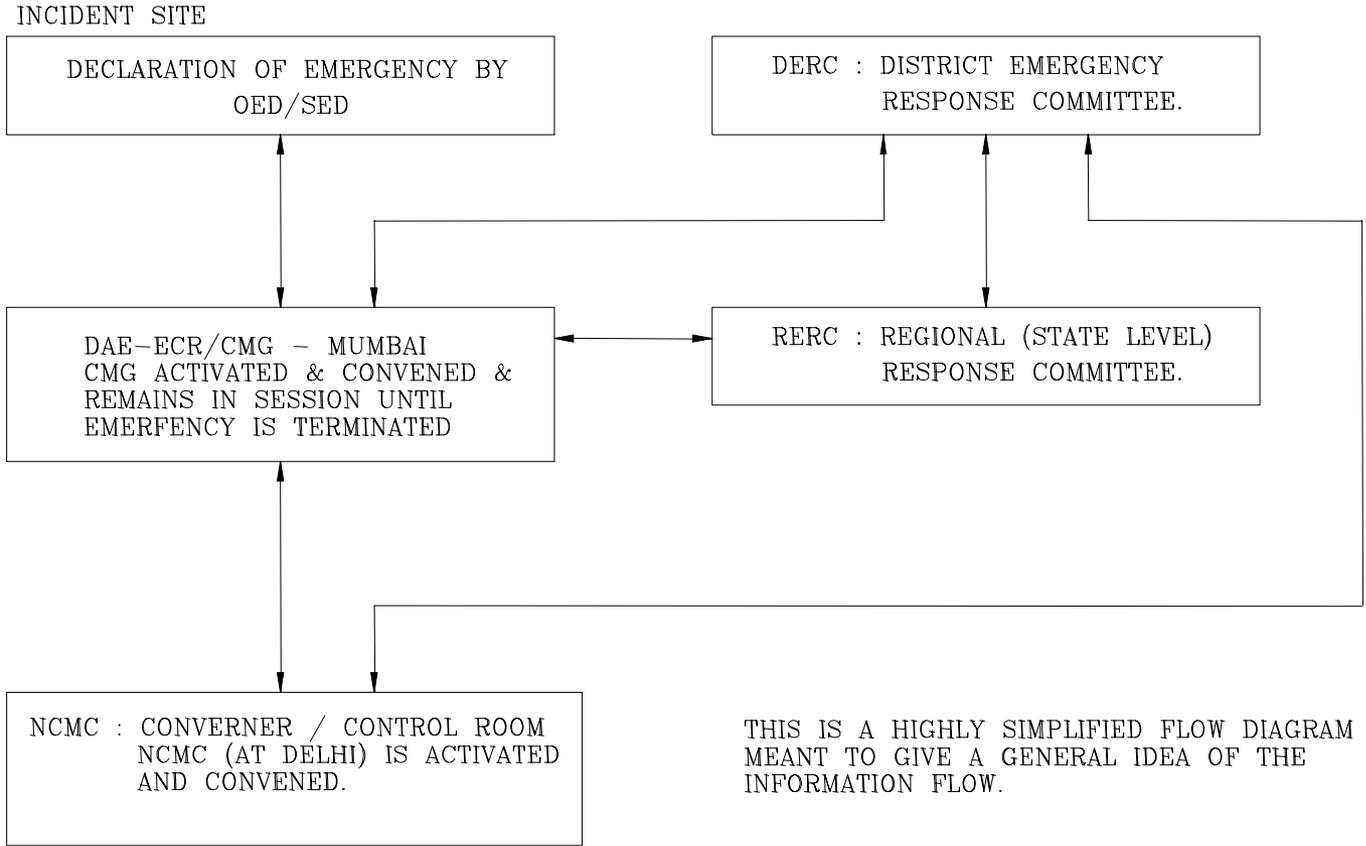


NUCLEAR OFF SITE EMERGENCY RESPONSE CO-ORDINATION COMMITTEE

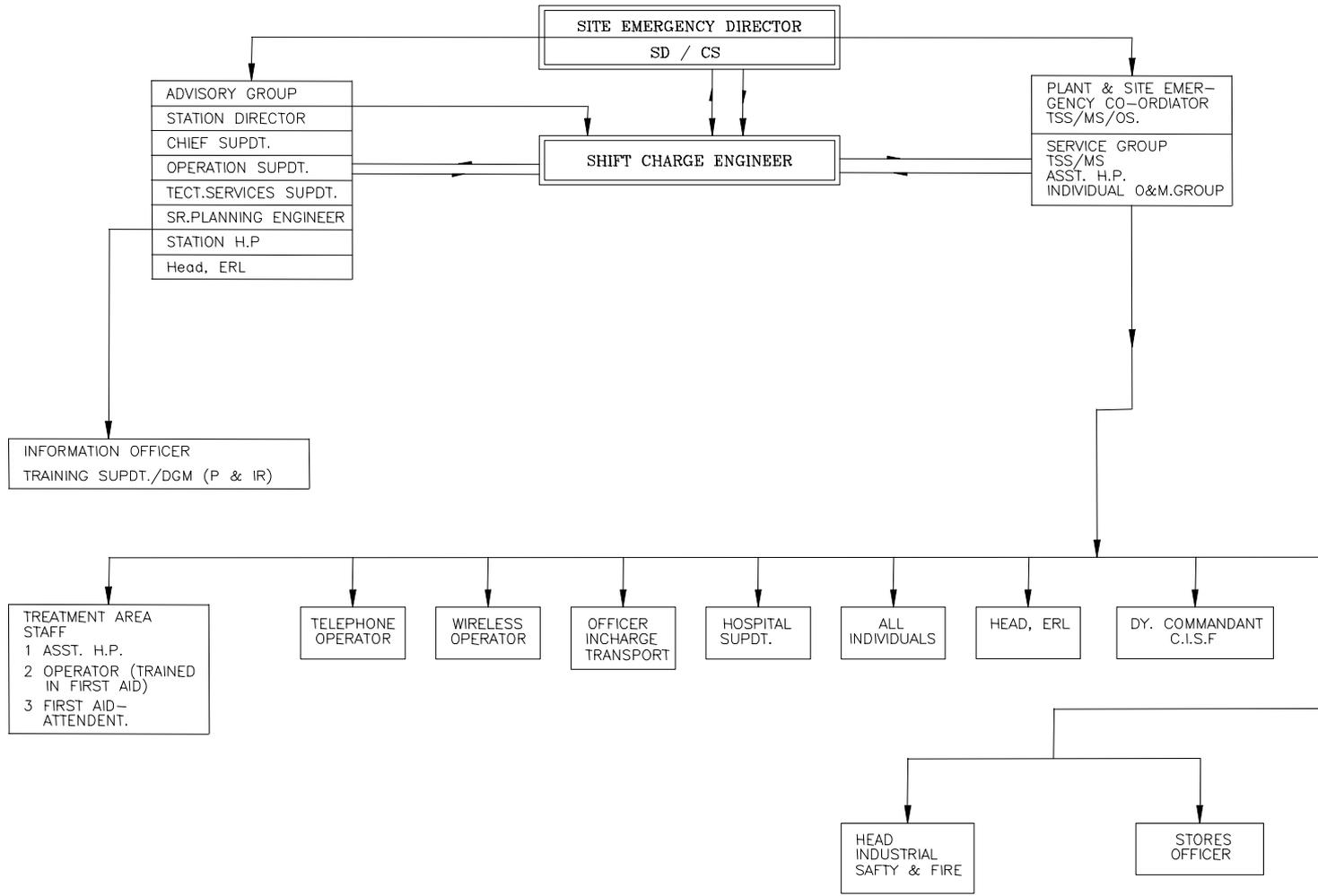
LEGEND:



FLOW OF INFORMATION DURING AN OFF SITE EMERGENCY AT A NUCLEAR FACILITY



KAKRAPAR EMERGENCY COMMITTEE ITS ORGANISATION AND FUNCTIONS



SCOPE OF EMERGENCY PREPAREDNESS PLAN

- **DEFINES:**

- ✓ EMERGENCY TYPES, PROTECTIVE ACTIONS, INTERVENTION LEVELS
- ✓ EMERGENCY ZONES AND SECTORS
- ✓ OFFSITE EMERGENCY ORGANISATION & RESPONSIBILITIES TO ESTABLISH, MAINTAIN AND IMPLEMENT EMERGENCY PLAN
- ✓ ACTION PLANS FOR INDIVIDUAL FUNCTIONARIES
- ✓ FACILITIES & EQUIPMENT REQD FOR HANDLING THE EMERGENCIES

- **DOES NOT COVER EMERGENCIES SUCH AS CYCLONE, FLOOD, SABOTAGE**

RESULTING RADIATION EMERGENCY IS IN SCOPE OF THIS PLAN

- **PLAN COVERS AREA UPTO 16KM RADIUS;**

(IF NECESSARY EMERGENCY ACTIONS COULD BE EXTENDED BEYOND 16 KM)

TYPICAL DATA IN EMERGENCY RESPONSE PLAN DOCUMENT

- **DEMOGRAPHIC DATA**
 - ✓ **SECTOR/DISTANCE-WISE LISTING OF VILLAGES, POPULATION (HUMAN AND CATTLE), TYPES OF HOUSES, MILK COLLECTION CENTRES**
 - ✓ **SECTOR/DISTANCE-WISE POPULATION CENTRES AND SHELTERING FACILITIES (SCHOOLS, REST HOUSES, HOSPITALS, COMMUNITY HEALTH CENTRES ETC.)**
- **METEOROLOGICAL DATA (HISTORICAL)**
 - ✓ **SECTOR-WISE WIND SPEED, DIRECTION, SECTORS LIKELY TO BE AFFECTED, WIND ROSES**
- **FOOD INTAKE PATTERNS**
- **ROADS/ROUTES FOR EVACUATION; & TRAFFIC DIVERSIONS**
- **MEDICAL FACILITIES – SECTORWISE LISTINGS**
- **KEY PERSONNEL – LIST & CONTACT DETAILS**
- **LIVESTOCK POPULATION DATA**
- **VEHICLES AVAILABLE – PUBLIC/PRIVATE (SECTOR-WISE)**
- **REQUIREMENT OF POLICE DEPLOYMENT**

RESOURCES & FACILITIES

- **MANPOWER**
FOR MANAGEMENT, HEALTH PHYSICS SURVEYS,
DECONTAMINATION, FIREFIGHTING, FIRST AID, DRIVERS,
TECH STAFF FOR RESCUE/RELIEF, MEDICAL,
COMMUNICATIONS
- **SIREN, EMERGENCY SURVEY VEHICLES**
- **EMERGENCY EQUIPMENT:**
RADIATION/ACTIVITY MONITORS PROTECTIVE EQPT,
EMERGENCY LIGHTS
- **COMMUNICATION FACILITIES**
- **MEDICAL FACILITIES, INCL. HOSPITAL, AMBULANCE,
HANDLING OF CONTAMINATED PERSONNEL**
- **ENVIRONMENTAL MONITORING & SAMPLING NETWORK &
DATA PROCESSING SYSTEM**
- **EMERGENCY SHELTERS**
- **EMERGENCY CONTROL CENTRE**

MAINTENANCE OF EMERGENCY PREPAREDNESS

- **EMERGENCY EXERCISES:**
 - PLANT EMERGENCY : ONCE IN A QUARTER**
 - SITE EMERGENCY : ONCE IN A YEAR**
 - OFFSITE EMERGENCY : ONCE IN TWO YEARS**
- **EMERGENCY EQPT : PERIODIC CHECKS**
- **TRAINING : SITE/OFFSITE PERSONNEL, TARGET PUBLIC**
- **REVISE/UPDATE DOCUMENT EVERY 5 YRS**

REQUIREMENTS RE EXCLUSION ZONE

- **MINIMUM 1.5 KM RADIUS**
- **CALCULATED DOSES FOR LIMITING DBAs SHALL NOT EXCEED 'REFERENCE DOSE LEVELS'**
 - ✓ **100 mSv WHOLE BODY**
 - ✓ **500 mSv THYROID**
- **LIMITING DBSs : INITIATING EVENT SIMULTANEOUS WITH IMPAIRMENT OF A MITIGATING SAFETY SYSTEM**
VIZ : LOCA + FAILURE OF ECCS
LOCA + FAILURE OF CONTAINMENT ISOLATION
- **ASSUMPTIONS RE DOSE CALCULATION**
 - ✓ **EXPOSURE PERIOD : INDEFINITE**
 - ✓ **EXPOSURE PATHWAY : EXTERNAL + INHALATION**
(INGESTION EXCLUDED)
 - ✓ **WORST METEOROLOGICAL CONDITIONS FOR FIRST TWO HRS, FOLLOWED BY AVERAGE METEOROLOGICAL CONDITIONS**

PROPOSED REVISIONS IN EXCLUSION ZONE REQUIREMENTS

- **REF. DOSE LEVELS:**
 - SAME AS BEFORE: 100mSv WB; 500mSv Thyroid
- **HOWEVER INGESTION DOSES FOR FIRST FEW HOURS TO BE CONSIDERED (MILK ROUTE)**

**CONSEQUENTLY THYROID DOSE OF 500mSv
APPORTIONED AS**

INGESTION : 300 mSv

EXT + INHALATION : 200 mSv

MINIMUM RADIUS : 1.0 KM

THANK YOU