**MERCANTILE MARINE DEPARTMENT**
Ministry Of Maritime Affairs
Government Of Pakistan

# STANDARD OPERATING PROCEDURE

## Radiation Protection Programmed for Maritime Transport of Radioactive Materials

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| SOP Number: | MMD-SOP-DG-004 |
| Version: | 1.0 |
| Issue Date: | June 2025 |
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| Approved by: | Principal Officer, Mercantile Marine Department<br>*(In coordination with PNRA and NDMA)*<br>Signature: _____<br>Date: June 2, 2025 |

### Note

MMD-SOP-DG-004, issued under authority of Pakistan Merchant Shipping Ordinance 2001 (Sections 362, 575, 609), establishes Pakistan's Radiation Protection Programme for maritime transport of Class 7 (radioactive materials) and INF Code cargo, including pre-shipment approval procedures, radiation protection standards, and emergency response coordination with PNRA and PMSA.

# 1. PURPOSE, SCOPE AND REGULATORY FRAMEWORK

## 1.1 Purpose

This SOP establishes Pakistan's Radiation Protection Programme for maritime transport of Class 7 (radioactive materials). It defines MMD's regulatory framework, PNRA's radiation safety authority, and coordination with PMSA for operational emergency response.

## 1.2 Scope

- All maritime transport of Class 7 materials in Pakistani waters/EEZ/ports
- Pakistani-flagged vessels carrying radioactive materials globally
- Foreign vessels with Class 7 cargo entering Pakistani jurisdiction

## 1.3 Three-Agency Framework for Class 7

**CLASS 7 COORDINATION FRAMEWORK**

**Three Separate Authorities Working Together**

### 1. MMD - Maritime Regulatory Authority:

- IMDG Code and INF Code compliance verification
- Pre-shipment documentation review
- Ship certification for radioactive cargo
- Stowage and segregation inspections
- Coordination with PNRA on licensing
- Technical advisor on maritime aspects during incidents

### 2. PNRA - Radiation Safety Authority:

- Radiation protection standards and dose limits
- Package design approval (IAEA standards)
- Transport licenses for consignors
- Radiation monitoring and measurements
- Emergency response team for radiological incidents
- Technical advisor on radiation protection

### 3. PMSA - Marine Operational Response:

- Operational command for Class 7 incidents at sea/ports (per NMDCP)
- PMSA vessels and aircraft deployment
- Coordination with Pakistan Navy and ports
- Integration of PNRA radiation specialists
- Integration of MMD maritime advisors
- On-scene incident management

**NOTE:**
MMD and PNRA provide technical expertise. PMSA conducts operational response per NMDCP. This division ensures radiation safety (PNRA), maritime compliance (MMD), and effective response (PMSA).

# 2. LEGAL AND REGULATORY FRAMEWORK

## 2.1 National Legislation

- Pakistan Merchant Shipping Ordinance 2001 (Sections 362, 575, 609)
- Pakistan Merchant Shipping (Carriage of Hazardous and Dangerous Substances by Ships) Rules, 2009
- Pakistan Nuclear Regulatory Authority Ordinance 2001
- PNRA Regulations for Safe Transport of Radioactive Material (PAK/914)

## 2.2 International Standards

- SOLAS 1974, Chapter VII, Regulation 17 (INF cargo)
- IMDG Code Chapter 2.7 (Class 7)
- IAEA Transport Regulations SSR-6
- INF Code (Irradiated Nuclear Fuel carriage)

# 3. RADIATION PROTECTION PRINCIPLES

## 3.1 Key Terms

| Term | Definition |
|---|---|
| **Radioactive Material** | Any material containing radionuclides where both the activity concentration and the total activity exceed specified values (IMDG Code 2.7.2.2) |
| **Transport Index (TI)** | Number assigned to a package, overpack or freight container, denoting the radiation level at 1 meter from the surface |
| **Criticality Safety Index (CSI)** | Number assigned to control accumulation of fissile packages to prevent criticality |
| **Dose Rate** | Radiation dose received per unit of time, measured in millisieverts per hour (mSv/h) |
| **Contamination** | Presence of radioactive material in unwanted locations or amounts |
| **INF Cargo** | Packaged irradiated nuclear fuel, plutonium, and high-level radioactive wastes carried on board ships (requires INF Code certification) |
| **ALARA** | As Low As Reasonably Achievable - fundamental radiation protection principle requiring exposures to be minimized |

### 3.2 Dose Limits (per PNRA Regulations)

| Category | Annual Dose Limit |
|---|---|
| Occupational Workers | 20 mSv/year |
| Ship Crew (regularly occupied areas) | 5 mSv/year |
| Public | 1 mSv/year |

### 3.3 IMDG Code Class 7 Categories

| Category | Radiation Level | Label Required |
|---|---|---|
| Category I - White | ≤ 0.005 mSv/h at surface | White label, TI = 0 |
| Category II - Yellow | > 0.005 to 0.5 mSv/h at surface, ≤ 0.01 mSv/h at 1m | Yellow label, TI > 0 but ≤ 1 |
| Category III - Yellow | > 0.5 to 2 mSv/h at surface, > 0.01 to 0.1 mSv/h at 1m | Yellow label, TI > 1 but ≤ 10 |

### 3.4 ALARA Principle

All operations involving radioactive materials shall be conducted in accordance with the ALARA principle - keeping radiation exposures As Low As Reasonably Achievable,

### 3.5 Basic Protection: Time-Distance-Shielding

- Minimize time near radioactive materials
- Maximize distance from radiation sources
- Use appropriate shielding

### 3.6 Dose Limits (per PNRA Regulations)

| Category | Annual Dose Limit |
|---|---|
| Occupational Workers | 20 mSv/year |
| Ship Crew (occupied areas) | 5 mSv/year |
| Public | 1 mSv/year |

## 4. MMD REGULATORY RESPONSIBILITIES

### 4.1 Pre-Shipment Approval

- Review dangerous goods manifest
- Verify PNRA transport license
- Check package certificates (IAEA compliance)
- Verify ship INF Certificate (if applicable)
- Review stowage plan and segregation

### 4.2 Inspections

- Verify radiation labels and markings
- Check segregation from other DG
- Request PNRA radiation survey if needed

### 4.3 Coordination with PNRA

- Forward Class 7 notifications to PNRA
- Request PNRA support for inspections
- Report non-compliances to PNRA

## 5. CLASS 7 INCIDENT NOTIFICATION AND RESPONSE

### 5.1 MMD Actions Upon Class 7 Incident

When MMD receives Class 7 incident notification:

1. Record incident details via MMD 24/7 line: +92 21 99214652
2. Classify package type, UN number, Transport Index, category
3. **Make DUAL notifications within 30 minutes:**

**(a) PMSA Disaster Response Centre: +92 21 9214624/25**

**(b) PNRA Emergency Response Team: +92 51 926 3001-6**

4. Provide initial assessment: package details, radiation category, EmS reference
5. Prepare to deploy MMD technical advisor

### 5.2 PMSA Operational Response for Class 7

Upon notification, PMSA assumes operational command per NMDCP:

- Activates Disaster Response Centre (DRC)
- Requests PNRA emergency response team deployment
- Requests MMD technical advisor deployment
- Deploys PMSA vessels/aircraft
- Establishes unified command structure
- Manages on-scene operations

### 5.3 Technical Support to PMSA Operations

#### 5.3.1 PNRA Technical Support (Radiation Safety)

PNRA provides to PMSA:

- Radiation monitoring equipment and surveys
- Contamination assessment
- Dose assessment for exposed personnel
- Decontamination guidance
- Package safety evaluation

### 5.3.2 MMD Technical Support (Maritime Regulatory)

MMD provides to PMSA:

- IMDG Code Class 7 and INF Code interpretation
- Ship certification verification
- Package documentation review
- Coordination interface with PNRA
- International notifications (IMO, flag state)

**NOTE:**
Detailed operational procedures for Class 7 emergencies are in PMSA's NMDCP and PNRA's National Emergency Response Plan for Radiological Emergencies. These are NOT MMD documents.

## 6. EMERGENCY CONTACTS

| Agency | 24/7 Contact |
|---|---|
| **MMD Emergency** | +92 21 99214652 |
| **PMSA DRC** | +92 21 9214624 / 9214625 |
| **PNRA Emergency** | +92 51 926 3001-6 |

# 7. REFERENCES

- MMD-SOP-DG-001: Emergency Response Procedures
- National Marine Disaster Contingency Plan (NMDCP)
- PNRA National Emergency Response Plan for Radiological Emergencies
- IMDG Code, INF Code, IAEA SSR-6