



2013 PAG Manual Revision

Focus on Changes from the 1992 Manual

Sara DeCair, US EPA

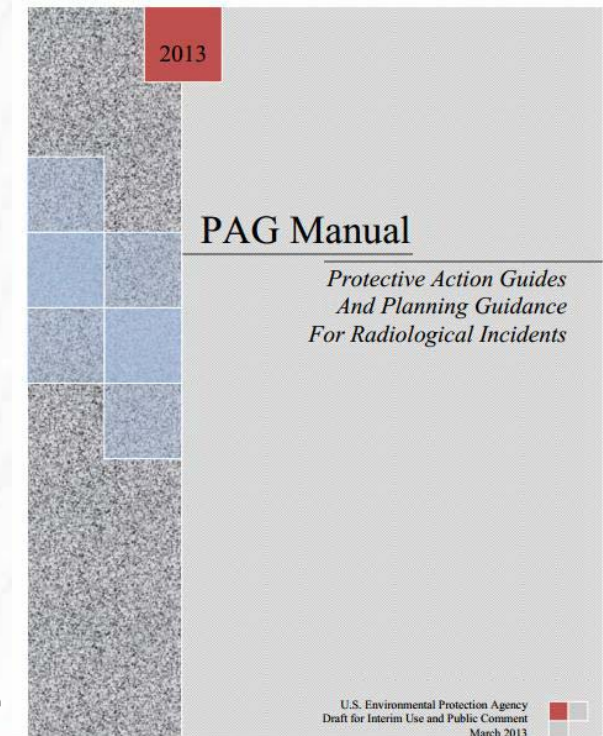
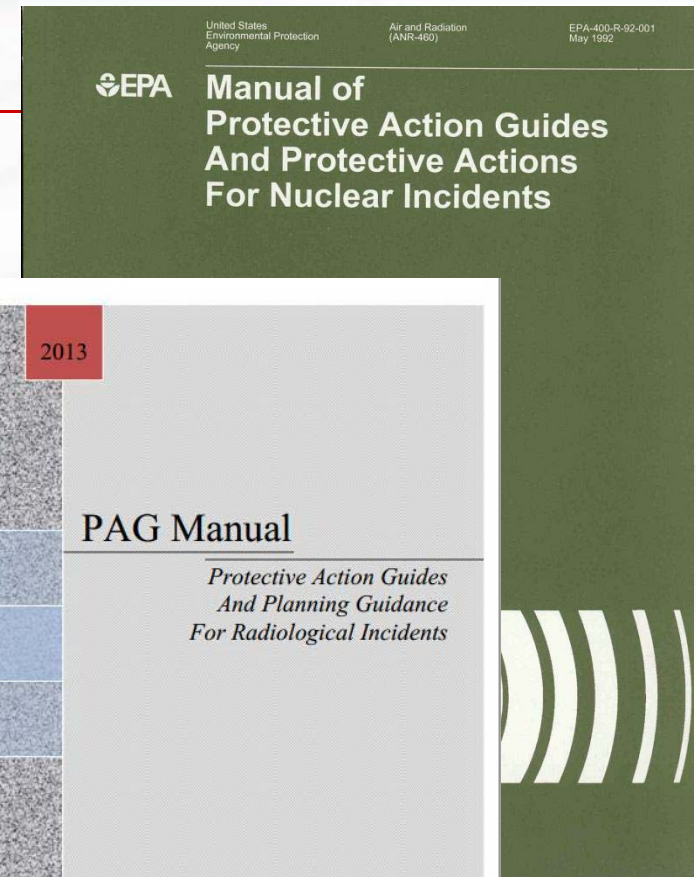
October 2015

Topics to Cover

- Compare 2013 & 1992 Manuals
 - ✓ FRMAC methods for DRLs
 - ✓ Early Phase, Worker guides, KI
 - ✓ Intermediate Phase, Reentry
 - ✓ Water, Food
 - ✓ Late Phase recovery
- Process & timeline
 - ✓ When will the final PAG Manual be out?

PAG Manual

- 1992 PAG Manual is still good, still in use
- Early, Intermediate Phases only; promised Water and Late Phase (Recovery) PAGs
- 2013 revision issued for comment and interim use



2013 Draft PAG Manual

- Clarifies the use of PAGs for all radiological incidents, including terrorism
- Lowers projected thyroid dose for KI, via FDA
- Requests input on drinking water guidance
- Refers to 1998 FDA food guidance
- Includes guidance for cleanup & waste disposal
- Updates dosimetry from ICRP 26 to ICRP 60, by referring to FRMAC methods

Updated dosimetry

- Updating to ICRP 60 series
 - ✓ Age-specific dose conversions
- Setting PAGs levels
versus
- Implementing PAG recommendations
 - ✓ Protective actions apply to whole communities
 - ✓ Conservatism built in
 - ✓ Don't avoid less dose than intended

FRMAC Methods by reference

- PAG Manual users are referred to FRMAC Assessment Manuals for calculations using up-to-date dosimetry.
 - ✓ Lookup tables of DCFs and DRLs not in PAG Manual
 - ✓ Updated more frequently
- Training on FRMAC methods ongoing

Early Phase

1992

- Evacuation/Shelter 1-5 rem (10-50 mSv)
 - ✓ thyroid/skin 5, 50 x higher
- KI 25 rem (250 mSv) thyroid dose (adult)
- Worker 5, 10, 25+ rem (50, 100, 250+ mSv)

2013

- Evacuation/Shelter 1-5 rem (10-50 mSv)
 - ✓ (no organ dose specified)
- KI threshold 5 rem (50 mSv) thyroid dose (child)
- Worker 5, 10, 25+ rem (50, 100, 250+ mSv)

Potassium Iodide (KI) Actions

- FDA recommends a multi-pronged approach:

Threshold Thyroid Radioactive Exposures and Recommended Doses of KI for Different Risk Groups				
	Predicted Thyroid exposure(cGy)	KI dose (mg)	# of 130 mg tablets	# of 65 mg tablets
Adults over 40 yrs	>500	130	1	2
Adults over 18 through 40 yrs	>10			
Pregnant or lactating women				
Adoles. over 12 through 18 yrs*	≥ 5	65	1/2	1
Children over 3 through 12 yrs		32	1/4	1/2
Over 1 month through 3 years		16	1/8	1/4
Birth through 1 month				

- A simplified approach:
 - ✓ Provide KI to public if 5 rem (50 mSv) child thyroid dose projected
 - ✓ This is a supplemental action; evacuation is the primary protection

Guidance for Emergency Workers

Dose (rem)	Activity	Condition
5	All	None
10	Protecting valuable property	Lower dose not practicable
25*	Lifesaving or protection of large populations	Lower dose not practicable

* Greater than 25 rem for lifesaving only to volunteers aware of the risks

Intermediate Phase

1992

- Relocate population
 - ✓ ≥ 2 rem (20 mSv) first year (projected dose)
 - ✓ 0.5 rem (5 mSv) any subsequent year
 - ✓ 5 rem (50 mSv) over 50 yrs
- Apply dose reduction techniques
 - ✓ < 2 rem (20 mSv)

2013

- Relocate population
 - ✓ ≥ 2 rem (20 mSv) first year (projected dose)
 - ✓ 0.5 rem (5 mSv) any subsequent year
 - ✓ (removed 50-year Relocation PAG)
- Apply dose reduction techniques
 - ✓ < 2 rem (20 mSv)

Re-entry Matrix

- New quick reference matrix
- Public, workers re-entering Relocation area to work during cleanup
- Basis: Relocation PAGs
- Assumptions: Detailed exposure scenarios in Operational Guidelines
- Do it yourself: RESRAD-RDD software

The screenshot shows a PDF document titled "PAG Manual for Interim Use and Comment 4-2-2013.pdf" in Adobe Reader. The document is a draft for interim use and public comment, dated March 2013. It contains a table with re-entry criteria for different phases and a graph showing limiting concentrations of Cs-137 for access to buildings.

Intermediate Phase (first 30 days and up to a year)	Reentry For Use of Critical Infrastructure	Radiation Worker Protection	Reentry For Use of Roads and Walkways	Reentry For Access to the Relocation Zone
	Public: 2,000 mrem (20 mSv) in first year (Preliminary Report on Operational Guidelines Developed for Use in Emergency Preparedness and Response to a Radiological Dispersion Device Incident, Operational Guidelines Group C). Doseimeters could be considered for the public.	Radiation Worker Protection: (dose not to exceed) 5,000 mrem (50 mSv) per year (Radiation Protection Guidance to Federal Agencies for Occupational Exposure, EPA 1987). Radiation workers have knowledge of the risks associated with radiation exposure, training to protect themselves and doseimeters to track their doses. During an incident response, workers (police, waste handlers) needed in contaminated areas could be trained and given doseimeters. The guidance for Radiation Workers applies throughout the response.	Public: 2,000 mrem (20 mSv) first year; 500 mrem (5 mSv) per year in subsequent years (Operational Guidelines, Group D). While the dose values here are similar to those for Use of Critical Infrastructure above, the derived concentrations measured as triggers are different because the exposure conditions are different.	Public: 500 mrem (5 mSv) over one year for temporary access with stay times dependent on reentry tasks and site-specific conditions (Operational Guidelines, Group D). "Stay time" is a term of art used in the radiation safety field. Stay times are the amount of time a person may access the contaminated area. These times vary based upon site-specific factors or incident characteristics such as indoor or outdoor work, sensitive populations and level of radioactivity. Section 7.1 of the Operational Guidelines, "Worker Access to Businesses for Essential Actions," provides tables and graphs of stay times at various limiting concentrations (see Figures 7.5 and Table 7.8). For example, if the maximum surface concentration is very effective, but requires specialized equipment and trained operators. Surface sealing is easier, but leaves the contamination in place, making it viable only in locations where the dose rates are low enough for occupation, or in low-occupancy areas. Repairing roads, lots and other paved surfaces is easy to implement, but can generate significant waste volumes. Unpaved areas can be further remediated by soil skimming (surface removal), deep plowing (turning the top foot or so of soil over) and appropriate chemical soil amendment methods like liming or chelating. As the Intermediate phase progresses, knowledge and experience increases and these methods can be re-applied, refined or customized for problem areas. Decisions about more difficult areas will benefit from professional judgment, additional analyses and application of more sophisticated technologies.

FIGURE 7.8 Limiting Concentrations of Cs-137 for Access to Buildings

Drinking Water

- National Primary Drinking Water Regulations emergency actions: Increased monitoring & notifications
- Comments requested on whether, and what value, an emergency PAG for water should be considered
- Referred to related guides from WHO, IAEA, DHS, FDA



FDA Food PAGs

1992

- 1982 FDA guidance
- NCRP 39 methodology
- Preventive PAG 0.5 rem (5 mSv) whole body and 1.5 rem (15 mSv) thyroid
- Emergency PAG 10 times higher, depends on impact
- Dose only, no activity levels provided

2013

- 1998 FDA guide, by reference
- ICRP 56 & NRPB methods
- One set of PAGs
 - ✓ 0.5 rem (5 mSv) whole body dose or
 - ✓ 5 rem (50 mSv) to most exposed organ or tissue
- Dose and derived intervention levels (DILs) provided

Late Phase: Cleanup Goal

- Customer expectation of cleanup goal = background?
- Prescriptive or flexible
- Time, costs, risks, benefits
- Varied legal authorities and funding sources
 - ✓ Depends on the material
 - ✓ Terrorism or not
 - ✓ More than one authority may apply cooperatively

Decision-Making Organizations

- Focus on process for reaching consensus:
 - ✓ Decision Team – might be requesting funding
 - Senior local, state and federal officials
 - ✓ Recovery Management Team
 - Senior leadership in the field recovery effort
 - ✓ Stakeholder Working Group
 - Community leaders, local businesses, nongovernmental representatives, members of the public
 - ✓ Technical Working Group
 - Select subject matter experts, communicators

Playing it out: Liberty RadEx

- Used Cleanup Advisory Forum (CAF) process to prioritize post-emergency phase cleanup and develop long-term cleanup strategy
- Technical Advisory Panel (TAP)
- Community Advisory Panel (CAP)



Technical Advisory Panel meeting

All too real: Japan

2. Intensive Contamination Survey Area

Designation of an intensive survey area by the Minister of the Environment

- Areas where the dose rate is over $0.23 \mu\text{Sv/h}$ (equivalent to over 1 mSv/y of additional dose).
- 104 municipalities in 8 prefectures (Iwate, Miyagi, Fukushima, Ibaraki, Tochigi, Gunma, Saitama, and Chiba).

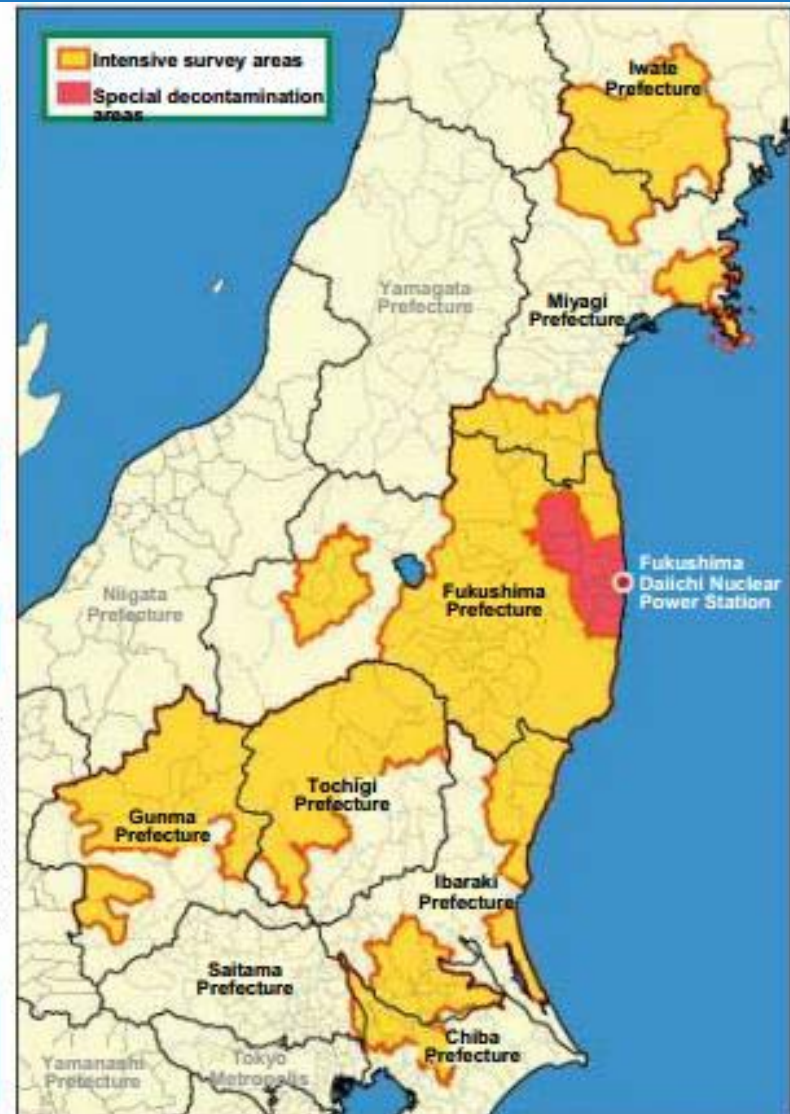
Surveys and measurement of the contamination status by the heads of the municipalities, etc.

Formulation of decontamination plans by the heads of the municipalities, etc.

Organizations responsible for taking measures

- Land under national control: National government
- Land under prefectural control: Prefectural governor
- Land under municipal control: Head of the municipality
- Land under independent control: Independent administrative agency
- Other land: Head of the municipality

Implementation of decontamination and other measures by the heads of the municipalities, in accordance with their decontamination plans



Late Phase: Waste Management

- Document focuses on options for disposal
 - ✓ Licensed LLRW disposal facilities
 - ✓ RCRA solid and hazardous waste landfills
 - ✓ Federal facilities/sites
 - ✓ Newly developed disposal capacity
 - ✓ Appropriate for level of hazard
- States bear primary responsibility
 - ✓ Waste volumes will drive decision-making
 - Could overwhelm existing disposal capacity (see Japan)
 - Need to be considered in early planning

Process & Timeline

- Adjudicated 5,000 comments
- Adding clarifications, improving readability
- Final PAG Manual
 - ✓ One-year period to incorporate into your plans
- You are a messenger!
- Let us know if you have questions
 - ✓ Sara DeCair: decair.sara@epa.gov 202-343-9108

The End

Thank you!