



Ministry of Defence

JSP 392

Radiation Safety Handbook

January 2008

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AUTHORITY

1 JSP 392 is sponsored by the Director of Safety and Claims as Chairman of the Occupational Health and Safety Board (OHSB) and produced and maintained by the Directorate of Safety and Claims (DS&C). It is issued under the authority of the Chairman OHSB.

MAINTENANCE

2 This Joint Service Publication (JSP) will be maintained on the Defence Intranet and Internet, and will be revised on an annual basis. Where amendment is necessary, these amendments will be announced by DCI GEN and any changes or additions also published on the Defence Intranet and Internet. All paper copies of JSP 392 material are uncontrolled.

3 Amendments will be developed on behalf of the Directorate of Safety and Claims (DS&C) and staffed through the JSP 392 Review Committee and Functional Safety Boards (FSBs). Major amendments and new inclusions will be submitted for endorsement at the appropriate level. These will be announced by Defence Instructions and Notices under Channel 7 – Safety, Health, Environment and Fire.

RECORD OF CHANGES

Amendment No	Amendment Record	Affected Pages	Date
1	DS&C	See table below	January 2008

Amendment No	Date	Text Affected
1	Jan 2008	Glossary Chapter 1 (paragraph 3) Chapter 2 (3) Chapter 3 (18) Chapter 4 (11, 26) Chapter 5 (3.2,15) Chapter 7 (1) Chapter 8 (8) Chapter 9 (5, 6) Chapter 11 (Annex A) Leaflet 3 (paragraph 14, 40, 43, 46) Leaflet 4 (14-15, 49, Annex B, Annex C) Leaflet 6 (Annex A (24, 40.12)) Leaflet 9 (36, 37, Annex C) Leaflet 10 (14.4) Leaflet 11 (34) Leaflet 13 (2, 3, 5, 6, 22) Leaflet 14 (26, Annex A, Annex B) Leaflet 17 (9) Leaflet 21 (Table 2, Annex B) Leaflet 25 (Annex A (12)) Leaflet 28 (Table 3) Leaflet 30 (All) Leaflet 31 (17) Leaflet 32 (3, 9, 10, 11, 20) Leaflet 39 (13, Annex E) Leaflet 40 (Annex B, Annex C)

NOTE: Minor changes such as typographical errors are not listed.

CHANNELS FOR COMMENT

4 Enquiries or proposed changes should be addressed to DS&C at the address below using the comments form or, if considered appropriate, through the Deputy Chief Environment and Safety Officer (Ministry of Defence).

dsc-ohs5@mod.uk

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 Occupational Health & Safety and Radiation Protection Team
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FILE REFERENCE

5 File reference DSC-06-10-01 relates to this JSP.

DISCLAIMER

6 Nothing contained within this JSP removes the responsibility of any duty holder to comply with the law and MOD requirements.

FOREWORD

The purpose of this publication is to enable Ministry of Defence (MOD) units (including Defence Agencies) to comply with legislation relating to radiation protection including environmental protection associated with sources of ionising and non-ionising radiation and the Secretary of State's Policy Statement on Safety, Health and Environmental Protection. In overseas commands this publication applies to all personnel, service and civilian.

This JSP is divided into two major parts comprising:

Volume 1, Radiation Policy, contains both ionising and non-ionising radiation and radioactive substances policy that applies across the MOD.

Volume 2, Radiation Instructions and Advice, provides instructions and advice on individual aspects of radiation protection for specific uses.

Issues associated with the interpretation or application of the policy in Volume 1 should be brought to the attention of the Directorate of Safety and Claims (DS&C). The contact details are:

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Requests for advice on the interpretation of the information contained within Volume 2 of this handbook or amendments to Volume 2 of this publication should be addressed to:

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c/o Institute of Naval Medicine
Crescent Road
Alverstoke
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GLOSSARY

Acceptance Test	An examination of newly installed medical and dental X-ray equipment to check the specifications and fitness of the equipment for the optimisation of radiation doses to patients.
Adequate training (Medical and Dental)	Tuition leading to competence in radiation protection and appropriate instruction, including practical experience, in diagnostic or therapeutic techniques involving ionising radiation as specified in Schedule 2 of the Ionising Radiation (Medical Exposure) Regulations (IRMER) 2000.
Annual limit of intake (ALI)	The largest value of annual intake of a radionuclide by a specific route into the body that will not exceed the annual dose limits either to the whole body or individual organs as given in Schedule 4 of IRR99 for a classified person.
Appointed Doctor	A registered medical practitioner who is appointed by the Health and Safety Executive (HSE) under Ionising Radiations Regulations 1999 (IRR99) to carry out the duties described in IRR99.
Approval Document	Document issued by the appropriate Regulatory Authority authorising an establishment to accumulate, discharge or dispose of quantities of radioactive material as specified in the approval document.
Approved Dosimetry Service (ADS)	A dosimetry service approved, by certificate in writing, by the HSE
Approved Dosimetry Record Keeping System (ADRKS)	The system used by an Approved Dosimetry Service (ADS) for maintaining dosimetry records.
Becquerel (Bq)	The unit of activity, defined as one disintegration per second.
Calendar quarter	Any consecutive 3-month period commencing 1 January, 1 April, 1 July, 1 October.
Calendar year	A 12-month period commencing 1 January.
Carrier	Any person or organization undertaking the conveyance of radioactive materials by any means of transport.
CBRN	Chemical, biological, radiological and nuclear.
Central Index of Dose Information (CIDI)	This is a Centralised Index system containing details of dose information for each classified person and identifying them to their Approved Dosimetry Laboratory. It is operated by the Health Protection Agency (HPA) for the HSE.
Classified person	A person designated in accordance with Regulation 20 of IRR99 or in the case of an outside worker employed by an undertaking in Northern Ireland or in another member state, a person who has been designated as a Category A exposed person within the meaning of article 21 of the European Council Directive 96/29/Euratom.

Closed source	A radioactive source from which the dispersal of the radioactive material is minimised by sealing, bonding or other means. This term includes bonded sources, homogeneous sources, laminated sources and sealed sources.
Comforter and carer	An individual who, other than as part of their occupation, knowingly and willingly incurs an exposure to ionising radiation resulting from the support and comfort of another person who is undergoing a medical exposure from an internal or external source.
Commanding Officer	The most senior officer of a ship, unit or establishment. Commanding Officer includes the Commandant, Officer Commanding, Captain, Master, Director, Head of Establishment and Medical Officer-in-Charge.
Committed dose	The effective or equivalent dose that will be accrued by the body or a tissue over a 50-year period following the intake of radioactive material.
Consignee	The recipient of transported radioactive material.
Consignor	Any person who sends radioactive materials in any form from a ship, unit or establishment.
Consignor's Certificate	A document certifying that the contents of a consignment of radioactive materials are properly described by name, are properly packaged, marked and labelled and are in a proper condition for transport according to the applicable transport regulations.
Contamination	The unintended presence of radioactive material on surfaces, areas, personnel (including any surface of the body or clothing) or objects or in gases or liquids.
Contingency plan	A plan designed to protect persons who may be affected by ionising radiation arising from any foreseeable accident or incident to which the plan relates.
Controlled area	An area designated in accordance with Regulation 16 of the IRR99, or in the case of Northern Ireland or in another member state an area subject to special rules for the purposes of protection against ionising radiation and to which access is controlled.
Critical examination	An examination of new or structurally modified medical X-ray rooms and dental surgeries to ensure that the installation and any associated safety features and warning devices satisfy the original design criteria and statutory requirements relevant to the restriction of exposure.
Curie	This is the non-SI unit of activity. One Curie is equal to 3.7×10^{10} becquerels (Bq). This term is officially obsolete, but may still be used in older publications or on some equipment.
Derived air concentration (DAC)	For any radionuclide, the DAC is that concentration in air which if breathed by a person (reference man) for a working year of 2000 hours (40 hours per week for 50 weeks per year) would result in the person receiving the Annual Limit of Intake by inhalation.

Derived limit	A limit derived from a dose limit or a secondary limit that is intended to prevent the dose limit being exceeded. Such limits include dose-rates in a work place, airborne contamination limits and surface contamination limits.
DNSR	Defence Nuclear Safety Regulator.
Dose constraint	A restriction on the prospective dose to individuals, which may result from a defined radiation source. Dose constraints are to be used in the planning stage of radiation protection.
Dose limits	Limits of radiation dose to the whole body or individual tissues or organs or extremities of the body in a specified period. These limits are given Schedule 4 of IRR99.
Dose rate	The rate at which a person or part of a person would receive a given dose of ionising radiation.
Dosemeter	A device used for measuring absorbed radiation doses.
Dosimetry	The measurement of radiation doses. It applies to both the devices used and to the technique.
Dstl ESD	Defence Science and Technology Laboratory's Environmental Sciences Department.
Emergency Exposure	An exposure of an employee engaged in an activity associated with the response to a radiation emergency, or potential radiation emergency in order to bring help to endangered persons, prevent exposure of a large number of persons or save a valuable installation of goods, whereby one of the dose limits for a classified person could be exceeded.
Employer	An employer is whoever employs an employee
Employer (For Medical/Dental Purposes.) (See Radiation Employer)	In the IRMER 2000, an employer is any natural or legal person who has the legal responsibility for a given installation, usually the Chief Executive of the National Health Service (NHS) Trust governing a Ministry of Defence Hospital Unit (MDHU) or single-Service Medical Director General (MDG) for other medical establishments.
Establishments	Includes all Naval, Army, Air Force, and MOD civilian (including Defence Agency) establishments and attachments.
Exemption Order	An order exempting radioactive substances from all or part of the Radioactive Substances Act. The Order may specify other requirements for those radioactive substances.
External radiation	Ionising radiation originating from outside the body of the person.
Focal point authority	The appropriate single-Service authority responsible for the oversight of advice and dissemination of radiation protection information. The focal point authority is to be notified of any new sources of ionising and non-ionising radiation.
Functional check	A check carried out using a radioactive source to demonstrate the consistency of response of an instrument before and/or during use.

Gaseous tritium light device (GTLT)	An instrument, piece of equipment, article or sub-assembly containing one or more GTLSs.
Gaseous tritium light source (GTLS)	A sealed glass container filled with gaseous tritium and coated internally with a phosphor.
Gray (Gy)	The SI unit of absorbed dose; defined as an energy deposition of 1 J.kg ⁻¹ of irradiated material.
Head of establishment	The senior officer at an establishment.
Health record	The record of medical surveillance of a classified person kept by the ship or establishment maintained by the employer in accordance with regulation 24(3) of the IRR99
High Activity Sealed Source (HASS)	<p>A sealed source (as defined by Directive 96/29/Euratom) containing a radionuclide whose activity at the time of manufacture is equal to or exceeds the activity levels specified in Annex I of EC Directive 2003/122/Euratom i.e. that the activity equals or exceeds 0.01 of the corresponding A1 value given in the IAEA Regulations for the safe transport of radioactive material. The following types of source/radioactive material do not fall within the scope of HASS:</p> <ul style="list-style-type: none"> a) Any component of a nuclear weapon; b) Any nuclear fuel element; c) Any radioactive substance inside a nuclear reactor; and d) Containers of radioactive material where the radioactive material would not constitute a sealed source in the absence of the container, and the container is for the purpose of storage or transport rather than to ensure the integrity of the source as in ISO 2919:1999. e) Radioactive waste, f) GTLSs and GTLTs
Instrument log	A record of radiation protection instrument maintenance, repair and calibration.
Internal radiation	Ionising radiation coming from inside the body of a person.
Ionising radiation	This is the transfer of energy in the form of particles or electromagnetic waves of the wavelength of 100 nanometres or less or a frequency of 3 x 10 ¹⁵ hertz or more capable of producing ions directly or indirectly. This includes Gamma (γ) rays, X-rays (either from radionuclides, X-ray equipment or produced as a by-product of some other apparatus), alpha (α) particles, beta (β) particles and neutrons.
Lead equivalent	The lead equivalent of a shielding material is the thickness of lead affording that same protection as the material in question under the same conditions of irradiation.
Leakage radiation	Ionising radiation that has passed through the protective housing of an X-ray tube, but not through the radiation aperture.
Local orders	Orders adequate to enable the work with ionising radiations at a particular ship, unit or establishment or to be carried out in accordance with statutory and MOD requirements.
Local rules	Rules made in accordance with regulation 17 of IRR99

Low Specific Activity (LSA)	Low Specific Activity material is defined as radioactive material, which by its nature has a limited specific activity, or a radioactive material for which limits of estimated average specific activity apply. Advice may be sought from the RPA.
Medical exposure	The exposure of a person to ionising radiation for the purpose of a medical or dental examination or clinical research under the direction of a suitably qualified person.
Movement	The transfer of radioactive materials within a ship, unit or establishment.
Non-ionising radiation	This is any electromagnetic radiation that is not ionising radiation. This includes laser radiation, electromagnetic fields and ultra-violet radiation.
Notifiable quantities	Values given in Schedule 8 of the IRR99.
Notification (EA)	A notification issued by the appropriate Regulatory Authority specifying the maximum holdings of radioactive material that may be used or stored at an establishment.
Nuclear programmes	Nuclear programmes are those to deliver and support the nuclear weapons and nuclear propulsion programmes
Occupational Exposure	The radiation exposure received as a result of work undertaken with ionising radiations.
Operator	<p>Any person who carries out any practical aspect associated with the procedure of a medical or dental exposure including those to whom practical aspects have been delegated, medical physics experts and, except where they do so under the supervision of a person who is adequately trained, persons participating in practical aspects as part of practical training (IRMER 2000) i.e. usually a radiographer or a medical physicist, but may be a medical or dental officer or other adequately trained medical or dental assistant or nurse. In the use of ionising radiation associated with veterinary examinations it is the person controlling the veterinary examination.</p> <p>Radiation (Emergency Preparedness and Public Information) Regulations (REPPPIR) 2001, defines an operator as the person in control of the operation of premises.</p>
Outside worker	A classified person who carries out services in the controlled area of any employer, other than the controlled area of his own employer.
Overexposure	The exposure of any person to ionising radiations to an extent that a dose limit is exceeded.
Overpack	An overpack is an enclosure, such as a bag or box, used by a single consignor to consolidate into one unit a consignment of two or more packages for the convenience of handling stowage and carriage.
Permit-to-work	A document giving formal approval for and stating conditions under which persons specified in the document may work in a controlled area.
Personal dose records	An Individual's record of their exposure.

Personal dosimetry number (PD)	A unique identifying number allocated by the Dstl Environmental Sciences Department (Dstl ESD) Approved Dosimetry Record Keeping Service to each person entered on the Approved Dosimetry Record Keeping System (ADRS).
Personal protective equipment	The term that includes both protective clothing and breathing apparatus.
Practitioner	A registered medical or dental practitioner, or other health professional who is entitled to take responsibility for an individual medical exposure (IRMER 2000) i.e. usually a radiologist, but may be the senior medical or dental officer.
Prior risk assessment	Before the commencement of a new activity involving work with ionising radiation a suitable and sufficient assessment of the risk to the employee or other person should be made. This assessment should identify the measures required to restrict the exposure of the employee or other person. Where the risk exists from a reasonably foreseeable accident, the employer, should prevent, or with the use of a contingency plan, limit the consequences of such an accident, and provide employees with appropriate information, instruction and training to restrict any exposure.
Protective clothing	Clothing provided to prevent the contamination of the person or the person's clothing or the lead rubber apparel worn when required during X-ray diagnostic procedures.
Public places	A location not controlled by the employer (Commanding Officer) i.e. on the outside of the site boundary, or on a public right of way through the site.
Qualified person	A person appointed by the employer having the necessary expertise, training and experience in instrumentation theory and practice to undertake or to supervise the examination and testing of radiation monitoring instruments to meet the requirements of the IRR99.
Radiation accident	An accident where immediate action is required to prevent or reduce the exposure to ionising radiation of employees or any other persons and includes a radiation emergency.
Radiation dose summary card	A card issued to persons working away from their parent establishment containing relevant personal details and a summary of their radiation dose.
Radiation emergency	Any event which is likely to result in any member of the public being exposed to ionising radiation arising from that event in excess of 5mSv effective dose in the one year period immediately following the radiation emergency. Any dose averted by any health protection measure taken during the 24 hours immediately following the event shall be disregarded.
Radiation employer	An employer who in the course of a trade, business or other undertaking carries out work with ionising radiation.
Radiation generator	Any apparatus that accelerates charged particles using a potential greater than 5 kV. Cathode-ray tubes and visual display units that do not produce a dose-rate of more than 5 $\mu\text{Sv h}^{-1}$ at a distance of more than 50 mm from any accessible surface are excluded.

Radiation passbook	Document issued by an ADS to record the estimated dose information for an outside worker working in a controlled area of another employer.
Radiation Protection Adviser (RPA)	A person or corporate body appointed by the employer to advise him on the observance of the IRR99 and on other health and safety matters in connection with ionising radiations. The individual or body must meet such criteria of competence as may from time to time be specified in writing by the HSE.
Radiation Protection Supervisor (RPS)	A person appointed in writing by the Commanding Officer in respect of a particular process or processes to ensure that work is carried out in compliance with IRR99.
Radiation Safety Assessment	An assessment prior to the introduction of new equipment, installations or working practices, to identify the nature and magnitude of the radiation hazard likely to arise during normal operating conditions and in the event of any foreseeable accident or incident.
Radiation Safety Officer (RSO)	An officer appointed by the Commanding Officer for the purpose of administering his responsibilities under these instructions.
Radiation Safety Standing Orders (RSSOs)	Orders produced by the ship, unit or establishment containing the information for the management of radiological protection.
Radiation weighting factor	A measure of the risk of late effects, principally cancer, caused by the type of radiation under consideration relative to X or gamma irradiation of a specified energy.
Radioactive material	Includes closed sources, articles containing radioactive substances, unsealed radioactive substances and non-radioactive articles contaminated with radioactive substances.

Radioactive Substance	<p>There are three definitions for a substance that must be regarded as Radioactive for the purposes of radiation protection, dependent upon which regulations are applicable:</p> <p>a. IRR99:</p> <p>Any substance which contains one or more radionuclides whose activity cannot be disregarded for the purposes of radiation protection.</p> <p>b. The Radioactive Substances Act 1993 (RSA93):</p> <p>i) a beta and/or gamma emitting solid radioactive material, whose activity exceeds 0.4 Bq g^{-1}.</p> <p>ii) a substance that has become radioactive through bombardment by neutrons or ionising radiations.</p> <p>For other materials seek the advice of the Radiation Protection Adviser.</p> <p>c. The Transport Regulations.</p> <p>Radioactive material shall mean any radioactive material containing radionuclides where both the activity concentration and the total activity in the consignment exceed the values in columns 4 and 5 of Table 1 of the IAEA Safety Standards Regulations for the Safe Transport of Radioactive Material, 1996 Edition, Revised. (TS-R-1) (Units and establishments should seek advice from their Radiation Protection Adviser or their Dangerous Goods Safety Adviser.)</p>
Radioactive waste	<p>This is defined in RSA93 as waste which consists wholly or partly of:</p> <p>a. a substance or article which, if it were not waste would be radioactive material, or</p> <p>b. a substance or article which has been contaminated in the course of the production, keeping or use of radioactive material, or by contact with or proximity to other waste falling within paragraph a.</p> <p>Radioactive material will be considered to be waste when designated by a ship, unit or establishment</p>
Radionuclide	<p>A radioactive species of atom characterised by its mass number, atomic number and nuclear energy state.</p>
Referrer	<p>A registered dental or medical practitioner, or other health professional who is entitled to refer individuals for medical exposure to a practitioner (Ionising Radiation (Medical Exposure) Regulations 2000) i.e. usually a General Practitioner (GP) or General Dental Practitioner (GDP), hospital doctor or dental surgeon or nurse practitioner.</p>

Regulatory Authority	<p>Authority responsible for the issue of Notifications for keeping and using radioactive materials and the issue of Approval documents for disposal of radioactive material. The Regulatory Authorities are as follows:</p> <ul style="list-style-type: none"> a. Environment Agency (EA) in England and Wales. b. Scottish Environmental Protection Agency (SEPA) in Scotland. c. Environment and Heritage Service (EHS) in Northern Ireland.
Respiratory Protective Equipment (RPE)	Equipment designed for protection of the individual against the hazards of airborne contamination.
Risk Assessment	Carried out to identify risks to health and safety to any person arising out of, or in connection with, work or the conduct of their undertaking. It should identify how the risks arise and how they impact those affected. This information is then used to aid decisions on how to manage those risks.
Sealed source	<p>A source containing any radioactive substance whose structure is such to prevent, under normal conditions of use, any dispersion of radioactive substances into the environment.</p> <p>Note. For the purposes of IRR 99 only, this definition is qualified to specifically exclude any radioactive substance inside a nuclear reactor or any nuclear fuel element.</p>
Sievert (Sv)	The SI unit of equivalent dose; defined as the product of the absorbed dose (in Gy) and the radiation weighting factor. It provides an indication of risk to health, principally of cancer, in humans.
Site radiography	Any industrial radiography undertaken outside an enclosure.
Special form	Radioactive material that is in the form of an indispersible solid or in a sealed capsule so constructed that it can only be opened by destroying the capsule.
Supervised area	An area designated by the employer in accordance with regulation 16 of IRR99.
Systems of work	Procedures designed to restrict the radiation dose to workers and other persons to as low as reasonably practicable.
Termination record	A record of the personal radiation dose of a previously classified person which is produced by the ADS when they cease to work for the Ministry of Defence or its Agencies.
Thermoluminescent dosimeter (TLD)	A device containing thermoluminescent material used to measure dose from ionising radiations.
Trainees	Persons aged 16 years and over (including students) who are undergoing training or instruction which involves operations which would, in the case of an employee, be work with ionising radiation.
Transport	The transfer of radioactive materials from a ship, unit or establishment

TREMCARD	Transport Emergency Card (TREMCARD) containing instructions for drivers carrying radioactive material abroad between European countries, the instructions for drivers are required in the language of the driver of the vehicle and the languages of the countries of transit and destination. Transport Emergency Cards (TREMCARD) detailing the required instructions are available in different languages. TREMCARDS can also be used for movements within the UK.
Type A package	A package that is permitted to contain up to the relevant A1 or A2 activity limit for any given isotope. Type A packages are designed to prevent the loss or dispersal of the radioactive package contents and prevent any increase in the maximum radiation level recorded at the external surface of the package during normal conditions of transport.
Unclassified radiation worker	A radiation worker who is unlikely to exceed three-tenths of the annual dose limits for classified persons
Unsealed radioactive substance	Any radioactive substance that is not a closed source. It includes non-radioactive objects contaminated with radioactive substances.
Uranium	Depleted uranium: Uranium containing less than 0.72% U-235 by weight. Natural uranium: Uranium containing the naturally occurring distribution of uranium isotopes (approximately 99.28% uranium-238 and 0.72% uranium-235 by weight).
Useful beam	The X-rays that come from the target and emerge through the aperture of an X-ray tube.
Visitors	Persons who enter radiation areas other than for purposes of undertaking work.
Working Level (WL)	Units used to indicate the level of exposure to radon daughters in air. One working level (1WL) = $2.08 \times 10^{-5} \text{ J m}^{-3}$.
Working Level Month (WLM)	An exposure of one working level month (WLM) would be received by working in a radon daughter concentration of one working level for 170 hours (i.e. a typical working month).
Work with ionising radiations	Any task entailing the production, processing, handling, use, holding, storage, moving, transport or disposal of any radioactive substance, or entailing the operation or use of any radiation emitting machine or apparatus, including instruction or training in which a person is engaged in as a trainee. This also includes work carried out in an atmosphere containing radon 222 gas at a concentration in air, averaged over any 24 hour period, exceeding 400 Bq m^{-3} , except where the concentration of short-lived daughter products does not exceed $6.24 \times 10^{-7} \text{ J m}^{-3}$.
Workload	A measure of the amount of use of X-ray equipment in a specific period, expressed in units of milli-amp minutes (mA min).

Workplace Supervisor (WPS)	Workplace supervisors are appointed where it is unnecessary to appoint an RPS, to undertake duties to ensure that work with sources of ionising radiation is carried out in accordance with legislation, the requirements of this publication and local orders for radiation safety. WPSs may be appointed to supervise radioactive materials, X-ray equipments or radon that do not require the setting up of designated areas, or a combination of these activities.
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COMMENTS FORM

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Comment:		

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Thank you for commenting on JSP 392

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