COURSE OVERVIEW FE0792
AWS Certified Radiographic Interpreter (CRI)

Course Title
AWS Certified Radiographic Interpreter (CRI)

Course Date/Venue
Session 1: August 04-08, 2024/Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE
Session 2: November 03-07, 2024/Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE

Course/Exam Date/Venue
Exam Date : TBA
Exam Venue : TBA
Exam Registration Closing Date: TBA

Course Duration/Credits
FE0792

Course Reference
Training: 5 days (40 hours)/4.0 CEUs/40 PDHs
Exam: 1 day (6 hours)
Total: 6 days

Course Description

This practical and highly-interactive course includes practical sessions and exercises where participants carryout radiographic interpretation. Theory learnt will be applied using radiographic film equipment as listed in the last pages of this document.

This course is designed to ensure that individuals have the knowledge to properly assess indications produced on radiographic media of weldments or adjacent base metal. It will prepare you for the CRI Certification exam, which is given at the end of the course.

Interpreting radiographs involves more than staring into a light box and making a "judgment call." The radiographic interpreter must determine whether the radiograph has been exposed properly, whether the image quality indicators have been correctly chosen in accordance with code requirements, and which specific acceptance criteria are applicable under the governing code. Failure to do any of these tasks can put your product, your company's reputation, or your job at risk.

Further, the course will also discuss the nature and properties of X and gamma radiation including the photographic aspects; the fundamental aspects of radiographic quality and the radiation safety principles; the x-ray and gamma ray equipment including the effects on radiographic quality in the event of equipment change; and the geometry of image formation and exposure calculations.

During this interactive course, participants will learn the proper application to welds including interpretation of radiographs of welds in different materials and joint geometries and multiple-film techniques; determine the depth of a flaw from one surface in a specimen by the practical use of the tube or source shift method (triangulation method); view radiographs; identify the film illuminator requirements, location markers, film density measurement and the loss of sensitivity in order to rectify faulty techniques; the welding technology, terminology for welds, welded joints, welding procedures, weld discontinuities and base metal discontinuities; the influence on techniques of geometry, size, surface condition, base metal composition, weld metal structure, surface cladding, heat treatments and weld repairs; the basic principles of fusion welding processes; the types of discontinuities associated with particular base metal/welding process combinations; and the types of discontinuities in welds and base metals detectable by radiography including the defect characteristics which influence detectability.

Course Objectives

Upon the successful completion of this course, each participant will be able to:-

- Prepare for the AWS radiographic interpreter exam and have enough knowledge and skills to pass such exam in order to get the AWS Radiographic Interpreter Certification
- Identify the nature and properties of X and gamma radiation including the photographic aspects
- Discuss the fundamental aspects of radiographic quality and the radiation safety principles
- Recognize x-ray and gamma ray equipment including the effects on radiographic quality in the event of equipment change
- Illustrate the geometry of image formation and exposure calculations covering the effect of distance on exposure and the use of exposure charts and calculators for X and gamma radiography
- Carryout proper application to welds including interpretation of radiographs of welds in different materials and joint geometries and multiple-film techniques
- Weld in small bore tubes and determine the depth of a flaw from one surface in a specimen by the practical use of the tube or source shift method (triangulation method)
- View radiographs and identify the film illuminator requirements, location markers, film density measurement and the loss of sensitivity in order to rectify faulty techniques
- Discuss welding technology, terminology for welds, welded joints, welding procedures, weld discontinuities and base metal discontinuities
- Describe the influence on techniques of geometry, size, surface condition, base metal composition, weld metal structure, surface cladding, heat treatments and weld repairs
- Explain the basic principles of fusion welding processes and identify the types of discontinuities associated with particular base metal/welding process combinations
- Recognize the types of discontinuities in welds and base metals detectable by radiography including the defect characteristics which influence detectability

Exclusive Smart Training Kit - H-STK®

*Participants of this course will receive the exclusive "Haward Smart Training Kit" (**H-STK®**). The **H-STK®** consists of a comprehensive set of technical content which includes **electronic version** of the course materials, sample video clips of the instructor's actual lectures & practical sessions during the course conveniently saved in a **Tablet PC**.*

Who Should Attend

This course provides an overview of all significant aspects and considerations of radiographic interpretation for all engineers and other technical staff working in the field of welding technology and quality assurance of welded joints using radiographic testing and in order to investigate material with such technique.

Exam Eligibility & Structure

Exam Candidates shall have the following minimum prerequisites:-

Visual Acuity	• Being a radiographic interpreter requires good near vision. To prove you have the necessary vision, you will need to pass an eye exam, showing you can read Jaeger Number 2 Letters at a distance of at least twelve inches with one eye. This test can be with or without glasses and should be taken within seven months before your scheduled exam or renewal
Education Requirements	• A valid high school diploma or general equivalency diploma (GED).
Training Requirements	• A minimum of 40 hours of organized training in radiographic interpretation/examination and should include topics contained in AWS B5.15-2010, Clause 9, Body of Knowledge
Experience Requirements	• At least one-year experience as a company-certified or nationally-certified individual in radiographic interpretation, or performing radiographic interpretation under the direct supervision of such an individual, is required. • In some cases, a maximum of six months of other NDE experience or education can be substituted for radiographic interpretation experience

Examination Requirements

- **General Requirements**: Candidates shall meet all of the following examination requirements in order to determine their comprehension and retention of the materials presented during training courses established for the purpose of qualification.
- **General Knowledge Examination**: Successfully complete (minimum 70% correct score) a multiple choice, written examination covering subjects related to welding, metallurgy, mathematics, radiographic theory, film selection, film processing, film handling and storage, and codes, specifications, and other standards.
- **Code Knowledge Examination**: Successfully complete (minimum 70% correct score) a multiple choice, written, open-book examination covering the contents relating to radiographic quality and film interpretation of API 1104, ASME B31.3, ASME B31.1, AWS D1.1, AWS D15.1, ASME Section VIII: Division 1, ASME Section I, ASME Section V, or others as new tests are developed.
- **Practical (Film Interpretation) Examination**: Successfully complete (minimum 70% correct score) a multiple choice, written examination consisting of interpreting a minimum of 10 radiographs to a code, specification, or other standard.
- **Composite Score Examination Requirements**: A composite score based on simple averaging of the three scores listed above shall be a minimum of 80% to successfully pass.
- **Examination Equipment**: Equipment used to permit participants to view radiographic specimens shall be checked prior to use to ensure their proper operation. Other devices used to verify film density, etc., shall be calibrated and in good operating condition. Equipment shall be of a type and model which, as closely as possible, matches that needed to view and interpret production radiographs.

Technical & Specification Documents and Reference Materials

Listed below are the effective editions of the publications required for the current Certified Radiographic Interpreter (CRI) Certification Examination. **Each participant must purchase these documents separately and have them available for use during the class as their cost is not included in the course fees**:-

Standard Titles

- AWS D1.1/D1.1M:2008, AWS Structural Welding Code – Steel
- API 1104, Welding of Pipelines and Related Facilities, 19th and 20th Editions
- ASME Section V, Article 2, Boiler & Pressure Vessel Code, Nondestructive Examination 2007
- ASME Section V, SE-94 (ASTM E 94-04) Standard Guide for Radiographic Examination
- ASME Section VIII, Division 1, Rules for Construction of Pressure Vessels, UW-51 and UW-52
- ASTM E 747-04, Standard Practice for Design, Manufacture and Material Grouping Classification of Wire Image Quality Indicators (IQI) Used for Radiology
- ASTM E 1025-05, Standard Practice for Design, Manufacture and Material Grouping Classification of Hole-Type Image Quality Indicators (IQI) Used for Radiology
- ASTM E 1032-06, Standard Test Method for Radiographic Examination of Weldments
- ASTM E 1742-08, Standard Practice for Radiographic Examination

Note: The above references will be available for temporary use by the students on the training course and by the candidates for certification. Users interested in purchasing these standards for their own use may do so below.

To purchase any of the AWS publications, visit the AWS Bookstore

Reference Titles

- American Society for Nondestructive Testing (ASNT). 1983. Making a radiograph. Vol. IV of Radiographic testing programmed instruction and classroom training books. Columbus, Ohio: American Society for Nondestructive Testing
- American Society for Nondestructive Testing (ASNT). 1983. Film handling and processing. Vol. V of Radiographic testing programmed instruction and classroom training books. Columbus, Ohio: American Society for Nondestructive Testing.
- American Society for Nondestructive Testing (ASNT). 1980. NDE characteristics of pipe weld defects, EPRI. ASNT-1195. Columbus, Ohio: American Society for Nondestructive Testing.
- Hellier, C., and S. Wenk, 1984. Radiographic interpretation. ASTN-008. Columbus, Ohio: American Society for Nondestructive Testing.
- American Welding Society (AWS) Committee on Methods of Inspection. 2000. Welding inspection handbook, 3rd ed. Miami: American Welding Society.
- American Welding Society (AWS). 1995. Practical reference guide to radiographic interpretation acceptance criteria. Miami: American Welding Society.
- Connor, L. P., ed. 1987. Welding processes. Vol.1 of Welding handbook. 8th ed. Miami: American Welding Society.
- American Welding Society (AWS) Committee on Methods of Inspection. 1999. Guide for the nondestructive examination of welds. AWS B1.10:1999. Miami: American Welding Society.

Note: AWS, API, ASTM, and ASME standards are available through The AWS Bookstore

Course Certificate(s)

Internationally recognized certificates will be issued to all participants of the course who completed a minimum of 80% of the total tuition hours.

Certificate Accreditations

Haward Technology is accredited by the following international accreditation organizations:

- American Welding Society (AWS)

  Haward Technology is the **International Agent** of the **American Welding Society (AWS)** and the Authorized Provider of AWS international certification examinations outside the USA. Haward Technology exhibits compliance and adherence to **AWS Quality Control Standards** in the development, conduct and delivery of certification courses and exams for welding and inspection professionals on behalf of the American Welding Society.

  The American Welding Society's certification programs are internationally recognized and are used as a benchmark of quality workmanship and skills within the welding industry around the world.

- The International Accreditors for Continuing Education and Training (IACET - USA)

  Haward Technology is an Authorized Training Provider by the International Accreditors for Continuing Education and Training (IACET), 2201 Cooperative Way, Suite 600, Herndon, VA 20171, USA. In obtaining this authority, Haward Technology has demonstrated that it complies with the **ANSI/IACET 2018-1 Standard** which is widely recognized as the standard of good practice internationally. As a result of our Authorized Provider membership status, Haward Technology is authorized to offer IACET CEUs for its programs that qualify under the **ANSI/IACET 2018-1 Standard**.

  Haward Technology's courses meet the professional certification and continuing education requirements for participants seeking **Continuing Education Units** (CEUs) in accordance with the rules & regulations of the International Accreditors for Continuing Education & Training (IACET). IACET is an international authority that evaluates programs according to strict, research-based criteria and guidelines. The CEU is an internationally accepted uniform unit of measurement in qualified courses of continuing education.

  Haward Technology Middle East will award **4.0 CEUs** (Continuing Education Units) or **40 PDHs** (Professional Development Hours) for participants who completed the total tuition hours of this program. One CEU is equivalent to ten Professional Development Hours (PDHs) or ten contact hours of the participation in and completion of Haward Technology programs. A permanent record of a participant's involvement and awarding of CEU will be maintained by Haward Technology. Haward Technology will provide a copy of the participant's CEU and PDH Transcript of Records upon request.

- British Accreditation Council (BAC)

  Haward Technology is accredited by the **British Accreditation Council** for **Independent Further and Higher Education** as an **International Centre**. BAC is the British accrediting body responsible for setting standards within independent further and higher education sector in the UK and overseas. As a BAC-accredited international centre, Haward Technology meets all of the international higher education criteria and standards set by BAC.

Course Instructor(s)

This course will be conducted by the following instructor(s). However, we have the right to change the course instructor(s) prior to the course date and inform participants accordingly:

Mr. Jim Davies, CSWIP, IIW, is a **Senior Inspection Engineer** with over **40 years** of extensive experience within the **Power**, **Petrochemical**, **Refinery**, **Oil** & **Gas** and **Aviation** industries. His expertise includes major Repair of **Steel Pipework**, **Composite Wrapping**, **Stainless Steel**, **Carbon Steel**, **Pressure Testing** of **Piping Systems**, **Tank** Internal & External **Piping**, **Pressure Vessels**, **Fabrication & Welding**, **Fabrication & Installation**, **Pipelines & Fabrication**, **Cutting & Welding** Equipment, **Welding** Procedures, **Welding Qualification** Testing, **Welder Training Testing** Program, **NDT** Inspection, Thermal Corner Protection Plate (**TCPP**), WPS/PQR's for **Welding** of **Nickel**, **Inconel**, **Duplex & Super Duplex Stainless Steels**, **Painting & Insulation**, **Chemflake** Application, **Inspection** of **Coatings**, **Hydrostatic Pressure Testing** of **Piping Systems**, **Hydrotest & Pneumatic** Testing, Engineering Resources and **Construction** for Oil & Gas Projects, **Testing of Concrete** Samples, **Concrete Coated Line Pipe**, Commissioning of **HVAC**, **Pipeline** Projects, **Piping & Flanges**, **Gas Turbine**, **Radiographic Interpretation** and has detailed knowledge of **Codes EN 13420-API 650/API 1104**, **API 6A/API 17D/API 650/DNV/ANSI B31.3/ANSI B31.3/ASME V**, **ASME IIX-IX/DNV OS F 101/NACE/ASTM/AWS D1.1/ISO 9001/14001 18001** & **ISO 13628-5 Umbilical's** and **NoBo**, **Apragaz** to ensure compliance with **ATEX**, **PED**, Codes & Regulations. Further, he is also well-versed in **Commissioning** Systems, **Pre-Commissioning & Commissioning** of Large **Oil & Gas** Projects, **Refinery Shutdowns & Turnarounds**, **LNG/LPG Storage Tanks**, **Wastewater Treatment Containment Tank**, **Electrical & Instrumentation** Systems & Subsystems, **Power** Stations, **Power** Distribution, **Earthing** Connections, **Mechanical** Completion, **Site Civil Works**, **Fire Protection** Systems, **Passive Fire Protection** (**PFP**), Project Turnover Packages, Safety Culture, Safety Management, **Confined Space**, **First Aid**, Safety in the Workplace, **Fire Fighting** Awareness, **Asbestos** Awareness, **Behavioural Based** Safety, Manual Handling & **Working at Height**, **OHSAS 18001**, **ISO 14001** and **ISO 9001** Quality Management Systems (**QMS**).

During his career life, Mr. Davies has held prime positions and has worked for international companies such as the **Construction QAQC Manager**, **Welding & NDT Specialist**, **Painting & Insulation Specialist**, **Client Quality & Pre-Commissioning Manager**, **Site Quality Manager**, **Client Quality and Pre-Commissioning Manager**, **QA/QC Manager**, **Welding Engineer**, **QA/QC Lead/Quality Team Leader** and **Senior Instructor/Trainer** from various international companies like the Statoil PROCOSYS MCCR, Project Power UK., Arcelormittal-C Shift Carbon Capture Project, Belguim Zeebrugge LNG Terminal, Petrofac/ROO Project, Chevron Gorgon Upstream JV, Saipem UK/Statoil, British Gas Hasdrubal Pipeline Project, Tunisia & BP PX2 Chemical Plant, Exxon and Total Antwerp.

Mr. Davies is a **Member** of **Chartered Institute of Building** (Eq. **MSc. Hons Degree**) and has **Diploma** of **NVQ Level 6 Construction Site Management** (Eq. **BSc. Hons Degree**). Further, he is an **IIW Certified International Welding Inspector**, a **CSWIP Senior Inspector Welding 3.2**, a **CSWIP Radiographic Interpreter**, a **British Gas/CSWIP Senior Pipeline Inspector 1**, a **Certified RT Level III** (Radiography Interpretation), a **Certified ASNT Level II** (**RT**, **MT**, **PT**, **UT**), an **EWF Diploma European Welding Inspection Specialist**, a **Member** of North American Corrosion Engineers (**NACE**), American Society for Quality (**ASQ**) and American Welding Society (**AWS**) and has further delivered numerous trainings, courses, seminars, conferences and workshops internationally.

Training Methodology

All our Courses are including **Hands-on Practical Sessions** using equipment, State-of-the-Art Simulators, Drawings, Case Studies, Videos and Exercises. The courses include the following training methodologies as a percentage of the total tuition hours:-

30% Lectures
20% Practical Workshops & Work Presentations
30% Hands-on Practical Exercises & Case Studies
20% Simulators (Hardware & Software) & Videos

In an unlikely event, the course instructor may modify the above training methodology before or during the course for technical reasons.

Training Fee

US$ 7,500 per Delegate + **VAT**. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Exam Fee

US$ 2000 per Delegate + **VAT**.

Accommodation

Accommodation is not included in the course fees. However, any accommodation required can be arranged at the time of booking.

Course Program

The following program is planned for this course. However, the course instructor(s) may modify this program before or during the course for technical reasons with no prior notice to participants. Nevertheless, the course objectives will always be met:

Day 1

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Nature & Properties of X & Gamma Radiation*** *Penetration ● Absorption ● Scatter ● Diffraction ● Transmission ● Rectilinear Propagation ● Photographic Properties*
0930 – 0945	*Break*
0945 – 1100	***Photographic Aspects*** *Types of Film & Paper Used in Industrial Radiography ● Characteristic Curves ● Characteristics ● Commercial Films & their Properties*
1100 – 1230	***Photographic Aspects (cont'd)*** *Filing & Separation Techniques ● Dark Room Procedures ● Intensifying Screens ● Spurious Indications*
1230 – 1330	*Lunch*
1330 – 1530	***Fundamental Aspects of Radiographic Quality*** *Quality of Radiation ● Optimum Working Densities ● Radiographic Contrast*
1530 – 1545	*Break*
1545 – 1650	***Fundamental Aspects of Radiographic Quality (cont'd)*** *Radiographic Definition ● Control of Radiographic Sensitivity & its Assessment by the Use of Image Quality Indicators*
1650 – 1700	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1700	*End of Day One*

Day 2

0730 – 0930	***Radiation Safety Principles*** *Controlling Personnel Exposure ● Time, Distance & Shielding*
0930 – 0945	*Break*
0945 – 1100	***Radiation Safety Principles (cont'd)*** *ALARA (As Low As Reasonably Achievable) ● Radiation Detection Equipment ● Exposure Device Operating Characteristics*
1100 – 1230	***X-Ray & Gamma Ray Equipment*** *The Effects on Radiographic Quality in the Event of Equipment Change*
1230 – 1330	*Lunch*
1330 – 1530	***Geometry of Image Formation*** *Geometric Unsharpness ● Control of Source-to-Object Distance, Object-to-Film Distance, Source-to-Film Distance ● Image Quality Indicator (IQI) Sensitivity ● Selection of Beam Angle*
1530 – 1545	*Break*
1545 – 1650	***Exposure Calculations*** *Effect of Distance on Exposure ● Use of Exposure Charts & Calculators for X & Gamma Radiography*
1650 – 1700	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1700	*End of Day Two*

Day 3

0730 – 0930	***Application to Welds*** *Interpretation of Radiographs of Welds in Different Materials & Joint Geometries ● Multiple-Film Techniques ● Welds in Small Bore Tubes ● The Determination of the Depth of a Flaw from One Surface in a Specimen by the Practical Use of the Tube or Source Shift Method (Triangulation Method) ● Exposure Geometry ● Coverage & Number of Exposures*
0930 – 0945	*Break*
0945 – 1100	***Viewing Radiographs*** *Film Illuminator Requirements ● Background Lighting ● Multiple-Composite Viewing ● Image Quality Indicator (IQI)Placement & Selection ● Personnel Darkroom Adaptation & Visual Acuity*
1100 – 1230	***Viewing Radiographs (cont'd)*** *Film Identification ● Location Markers ● Film Density Measurement & Calibration ● Film Artifacts ● Analyze the Loss of Sensitivity in Order to Rectify Faulty Techniques*
1230 – 1330	*Lunch*
1330 – 1530	***Welding Technology*** *Terminology for Welds ● Welded Joints ● Welding Procedures ● Weld Discontinuities ● Base Metal Discontinuities*
1530 – 1545	*Break*

1545 – 1650	***Welding Technology (cont'd)*** *Influence on Techniques of Geometry, Size, Surface Condition, Base Metal Composition, Weld Metal Structure ● Influence of Surface Cladding, Heat Treatments & Weld Repairs ● Basic Principles of Fusion Welding Processes ● Types of Discontinuities Associated with Particular Base Metal/Welding Process Combinations ● Types of Discontinuities in Welds & Base Metals Detectable by Radiography ● Defect Characteristics which Influence Detectability ● Welding Safety*
1650 – 1700	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1700	*End of Day Three*

Day 4

0730 – 0930	***VIDEO (Use of Measuring Tools for The AWS CRI Hands-On Exam)***
0930 – 0945	*Break*
0945 – 1100	***Hands-On Workshop*** *Use of Tools for Measuring and Weld Examination*
1100 – 1230	***Hands-On Workshop (cont'd)*** *Use of Tools for Measuring and Weld Examination (cont'd)*
1230 – 1330	*Lunch*
1330 – 1530	***Hands-On Workshop (cont'd)*** *Use of Tools for Measuring and Weld Examination (cont'd)*
1530 – 1545	*Break*
1545 – 1650	***Hands-On Workshop (cont'd)*** *Use of Tools for Measuring and Weld Examination (cont'd)*
1650 – 1700	***Recap***
1700	*End of Day Four*

Day 5

0730 – 0930	***Mock Exam***
0930 – 0945	*Break*
0945 – 1100	***Mock Exam (cont'd)***
1100 – 1230	*Lunch*
1230 – 1330	***Mock Exam (cont'd)***
1330 – 1530	*Break*
1530 – 1545	***Mock Exam (cont'd)***
1545 – 1645	***Mock Exam Conclusion***
1645 – 1700	*Presentation of Course Certificates*
1700	*End of Course*

Day 6: ***TBA (as per AWS-CRI exam schedule)***

0730 – 1030	***AWS – Certified Radiographic Interpreter (CRI) Examination*** *Part A General Knowledge Exam (70 questions) and Part C Code Knowledge Exam (78 questions)*
1030 – 1130	*Break*
1130 – 1430	***AWS – Certified Radiographic Interpreter (CRI) Examination (cont'd)*** *Part B Practical (Film Interpretation) Exam (40 questions)*
1430	*End of Examination Day*

Practical Sessions

Practical sessions will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout welding inspection using the "LED Film Viewer", "Film Densitometer", "Radiographic Standard Films", "Film Image Scale" "Film Density Strip" and "Film Developer & Fixer" suitable for classroom training.

LED FILM VIEWER

Technical Specifications:

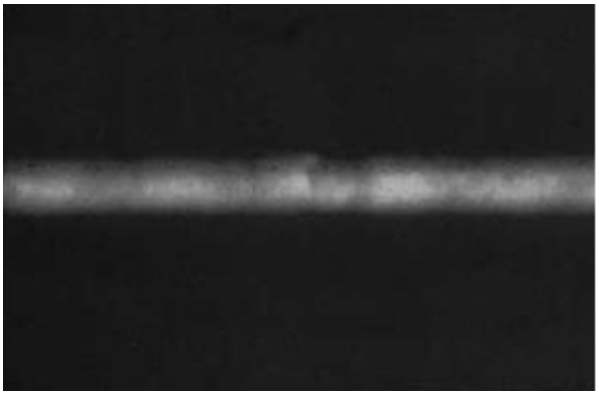
- Light Source – LED (White)
- Viewing density range – Up to 1.0 up to 4.5. D.
- Power source – AC, 230V 50/60Hz
- Max Luminance – 84,600 Cd/m2
- Film viewer body –Powder Coated Aluminium Body.
- Weight – 3.6 Kg
- Operating temperature: (-)10 C to (+) 60C .
- Cooling – High speed fans.
- Variable Light intensity control.
- Foot –switch control and cover on viewing screen.

Common features for all Film Viewers

- All film viewers are High Intensity type for viewing Industrial X-ray Films.
- A step-less control is provided for controlling Light Intensity.
- All film viewers are provided with Cooling fan, Heat absorbing glasses etc.
- A foot control switch helps in easy on-off operation.
- A built-in table lamp helps in making notes in dark.

Standard Radiographs/Local Radiographs

Standard Film Strip



Sample Exposed RT Films

Radiographic Standard Films

Film Image Scale

Film Density Strip

Course Coordinator
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