



# MAIRODI MANDIRI SEJAHTERA

TRAINING, CONSULTING & ENGINEERING SERVICES

Alamat: Gedung Dapenpos Lt.2, Jl. PH.H. Mustofa No.35 , Bandung, Indonesia, 40124  
Telp/Fax: +62-22-721 5668, 721 5416, Homepage: [www.mairodi-training.com](http://www.mairodi-training.com)

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## Training Syllabus : **HVAC SYSTEM: OPERATION AND MAINTENANCE**

### **INTRODUCTION :**

Heating, Ventilation and Air-Conditioning System: Operation and Maintenance, covers the fundamentals and practical applications for understanding air-conditioning systems including the operation and maintenance. The comprehensive coverage of the basic theory, latest terminology, system analysis, optimization concept, and calculation methods to make this the most complete course available today in achieving an economical system. Fundamentals of air-conditioning system give comprehensively understanding air treatment and heat transfer principle in reducing energy cost, besides essential knowledge of fluid mechanics in air conditioning system. Those all play important role on operation and maintenance of air conditioning systems. Participating in this course, you enable to analyze and recommend the most effective solution available in air conditioning system for operation and maintenance, enable to utilize energy as possible as saving due to limited energy resources, and also you are familiar and better understanding of all aspects relate to efficient air-conditioning system in building.

### **WHO SHOULD ATTEND THIS TRAINING ? :**

- a. Technicians
- b. Mechanical and facility engineers
- c. Who responsible for operating and maintaining mechanical equipments for building

### **TRAINING MATERIAL OUTLINE :**

1. Basic Theory of HVAC
  - a. Basic Concept of HVAC
  - b. Basics of Heat and Measurement
  - c. Thermodynamic Properties and Process
  - d. Psychometrics and Air Treatment
  - e. Global Issues in Environment
  - f. Unit and Conversion
2. Refrigeration and Refrigerants
  - a. Montreal and Kyoto Protocol
  - b. Refrigerant Types and Naming Rule for Refrigerants
  - c. Refrigerant Requirements and Desirable Qualities
  - d. Refrigerant Selection
  - e. Suitable of Oil and Refrigerant
  - f. Vapor Compression and Vapor Absorption Cycles



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- g. Evaporative Cooling and Cooling Tower
- h. Storage System
- i. Water Systems and Unitary Systems
- 3. Air Distribution System
  - a. Unitary and Central System
  - b. Single-Zone Systems
  - c. Multiple-Zone Systems
  - d. Terminal Reheat Systems
  - e. Dual-Duct or Multi-zone System
  - f. Pressure Drop in Duct
  - g. System Balancing
  - h. Centrifugal Fans and Their Characteristics
  - i. Air Distribution in Rooms
  - j. Diffusers and Induction
- 4. Hydronic System
  - a. Water and Refrigerant Piping
  - b. Comparison of Water and Air as Heat-Conveying Media
  - c. Heat Distribution from Hot-Water System
  - d. High-Temperature Water Systems
  - e. Available Pipe and Tubing
  - f. Pressure Drop in Water Piping Installation
  - g. Pressure Drop in Refrigerant Piping Installation
  - h. Pump Characteristic and Selection
- 5. Basic Automatic Controls
  - a. Basic Electricity and Magnetism
  - b. Introduction to Automatic Controls
  - c. Automatic Control Components and Applications
  - d. Troubleshooting Basic Control
- 6. Safety, Tools, and Equipment
  - a. General Safety Practices
  - b. Tools and Equipment
  - c. Fasteners
  - d. Tubing and Piping
  - e. Calibration Instrument
  - f. General Maintenance
- 7. Leak Detection, Pumping Down and Charging
  - a. Dye Systems
  - b. Test Pressures
  - c. Methods of Testing
  - d. Bubble Test
  - e. Halide Torch



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- f. Electronic Leak Detector
  - g. System Evacuation
  - h. Refrigerant Recharging
  - i. Refrigerant Recovery
  - j. Recycling and Reclaiming
8. Operating Principles and Symptoms
- a. Temperature, Humidity and Air Motion
  - b. Air Measurement
  - c. Calculating the Operating Head Pressure
  - d. Compressor Pressure Ratio
  - e. Air Handling Unit
  - f. Fan Coil Unit
  - g. Filter Check
  - h. Troubleshooting and Symptoms of System Faults
  - i. Troubleshooting Refrigeration Systems
  - j. Troubleshooting Hydronic Systems
  - k. Troubleshooting Air Distribution Systems
9. Service Diagnosis and Repair
- a. Definition of Reparation
  - b. Replacing a Thermostatic Expansion Valve
  - c. Replacing the Filter Drier
  - d. Compressor Efficiency Test
  - e. Water Cooled Condensers: Scale and Corrosion
  - f. Compressor Motor Burn-out: System Flushing
  - g. Pressure Controls
  - h. Special Duct Problems and Duct Maintenance
  - i. Special Piping Problems and Hydronic Maintenance

**INSTRUCTOR :** DR. Ir. I Made Astina, M.Eng. and Team

**VENUE :** Kagum Group Hotel Bandung (Golden Flower, Banana Inn, Serela, Gino Feruci), Amaroossa Hotel, Noor Hotel, Grand Setiabudi Hotel, dll

**TRAINING DURATION :** 4 days



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## TRAINING TIME :

Januari 2024	Februari 2024	Maret 2024	April 2024
2 - 5 Januari 2024	5 - 8 Februari 2024	4 - 7 Maret 2024	1 - 4 April 2024
8 - 11 Januari 2024	12 - 15 Februari 2024	12 - 15 Maret 2024	22 - 25 April 2024
15 - 18 Januari 2024	19 - 22 Februari 2024	18 - 21 Maret 2024	29 April – 2 Mei 2024
22 - 25 Januari 2024	26 - 29 Februari 2024	25 - 28 Maret 2024	
29 Jan – 1 Feb 2024			
Mei 2024	Juni 2024	Juli 2024	Agustus 2024
6 - 9 Mei 2024	3 - 6 Juni 2024	1 - 4 Juli 2024	5 - 8 Agustus 2024
13 - 16 Mei 2024	10 - 13 Juni 2024	8 - 11 Juli 2024	12 - 15 Agustus 2024
20 - 23 Mei 2024	19 - 22 Juni 2024	15 - 18 Juli 2024	19 - 22 Agustus 2024
27 - 30 Mei 2024	24 - 27 Juni 2024	22 - 25 Juli 2024	26 - 29 Agustus 2024
		29 Juli – 1 Agustus 2024	
September 2024	Oktober 2024	November 2024	Desember 2024
2 - 5 September 2024	1 - 4 Oktober 2024	4 - 7 November 2024	2 - 5 Desember 2024
9 - 12 September 2024	7 - 10 Oktober 2024	11 - 14 November 2024	9 - 12 Desember 2024
16 - 19 September 2024	14 - 17 Oktober 2024	18 - 21 November 2024	16 - 19 Desember 2024
23 - 26 September 2024	21 - 24 Oktober 2024	25 - 28 November 2024	
	28 - 31 Oktober 2024		

## INVESTMENT PRICE/PERSON :

1. Rp 8.750.000/person (full fare) or
2. Rp 8.500.000/person (early bird, payment 1 week before training) or
3. Rp 8.250.000/person (if there are 3 or more participants from the same company)

## FACILITIES FOR PARTICIPANTS:

1. Training Module
2. Flash Disk contains training material
3. Certificate
4. Stationeries: NoteBook and Ballpoint
5. T-Shirt
6. Backpack
7. Training Photo



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8. Training room with full AC facilities and multimedia
9. Lunch and twice coffeebreak everyday of training
10. Qualified instructor