



What's wrong with our industry?

First of all it is a great industry, where else can you be working at Randwick Racecourse in the morning, then a hospital and finish the day working on a chiller in a pharmaceutical factory?

Where else can you work where you know you won't be doing the same thing every day? We can repair fractured pipes, stop water dripping through ceilings, or fault find on a highly sophisticated printed circuit board on any given day.

So we have established that there is variety in our work, not only by the places we service, but also what we do. The money and conditions are good overall, all service technicians generally get a good salary, and a company phone and vehicle.

So why the hell are we not attracting the right calibre of apprentices to our industry?

REFRIGERATION MECHANICS TRADE COURSE SYLLABUS GUIDE


STAGE 1
1977-78
2HPW
2HPW PER WEEK

WEEK	PRINCIPALS OF REFRIGERATION	2HPW	PRACTICAL	2HPW	CUSTOMER RELATIONS	2HPW FOR 12 WEEKS
TERM 1						
1	HISTORY METHODS of refrigeration - use of micrometer, calculations volume, area.		FILING EXERCISE - hexagonal gauge.		BEHAVIOUR ON THE JOB - accept responsibility for own behaviour, courtesy, appearance, cleanliness, punctuality.	
2	GENERAL APPLICATIONS, domestic, commercial, industrial calculations, compressor, safety aspects, drawings.		FILING EXERCISE - hexagonal gauge.		SELF KNOWLEDGE - understand and admit what he can, cannot do, personal strengths - weaknesses in knowledge etc.	
3	DEFINITION, EXPLANATION refrigeration terms related to the elementary cycle.		PINCH OFF TOOL		CUSTOMER RELATIONS, location, maintenance - regard hygiene to firm and associates, understand how attitude affect customers.	
4	MEASUREMENT OF HEAT, TEMPERATURE - effect of pressure on boiling point.		PINCH OFF TOOL		THE CUSTOMER - identifying types of customers, understanding their behaviour.	
5	PRESSURE, pressure temperature relationship - relationship.		PINCH OFF TOOL		THE CUSTOMER - appreciate that the customer pays for good and efficient service.	
6	COMPRESSION SYSTEM, explanation simple cycle low and high side, pressure terms, determination fixed suction state points.		10 mm. TUBE EXERCISE		SKILLS to develop communication - use skills in communication, clear concise phrase as possible conversation.	
7	MAJOR COMPONENTS - compressor, condenser, evaporator, refrigeration controls.		12 mm. TUBE EXERCISE		SKILLS to develop communication - practice in reading comprehension, practice in writing skills.	
8	MAJOR COMPONENTS - liquid suction, discharge lines, receiver, calculations pressure.		15 mm. TUBE EXERCISE		SKILLS to develop communication - practice listening skills, practice clear thinking, problem solving.	
9	HEAT AND EFFECT OF HEAT - calculations, heat transfer.		SILVER SOLDERING TUBES		COMMUNICATING TWO WAY INSTRUCTING - with customers, operators employed by customers.	
10	HEAT AND ITS MEASUREMENT - calculations, use of tables, specific, latent heat, V factors.		HEAT EXCHANGER		SOURCES OF TECHNICAL information - phenomena used to build up technical knowledge for customer advice.	
11	HEAT TRANSFER conduction, convection, radiation - effect of colour.		HEAT EXCHANGER		HANDLING DIFFICULT situations - influence customers on price rise, non-availability of parts, etc.	
12	LATENT HEAT, SENSIBLE HEAT, specific heat (relative to products) - heat quantities.		VALVE MANIFOLD		EXAMINATION	
TERM 2						
13	GAS LAWS - THEORY		SOFT SOLDER EXERCISE		ENGINEERING DRAWING	2HPW FOR 12 WEEKS
14	SATURATED VAPOUR, superheated vapour, sub-cooled liquids, condensation, evaporation - laboratory demonstrations.		SHEET METAL TRAY		DRAWING PRACTICE types of lines - theoretical drawing practice.	
15	SIMPLE REFRIGERATION CYCLE		SHEET METAL TOOL BOX		FREE HAND SKETCHING - orthographic views with dimensions from given pictorial views.	
16	ANALYSIS - cycles of temperature, pressure, graphical interpretation heat, refrigeration cycle.		SHEET METAL TOOL BOX		ORTHOGRAPHIC PROJECTION - orthographic views with dimensions from given pictorial views.	
17	RELATIVE DENSITY REVISION - laboratory - relative density, calculations - relative density.		SHEET METAL TOOL BOX		ORTHOGRAPHIC PROJECTION - orthographic views with dimensions from given pictorial views.	
18	HALF YEARLY EXAMINATION		SHEET METAL TOOL BOX		LETTERING DIMENSIONING - Australian Standards.	
19	BASIC CHEMISTRY - properties of matter, elements, compounds, mixtures, physical change.		SHEET METAL TOOL BOX		ORTHOGRAPHIC PROJECTION - orthographic views with dimensions from given pictorial views.	
20	BASIC CHEMISTRY - chemical change, atoms, atomic structure, periodic table.		SHEET METAL TOOL BOX		DRAWING IN OBLIQUE - oblique views from given isometric and orthographic views.	
21	BASIC CHEMISTRY - molecules, chemical combination, e.g. electrovalence, covalence, pH scale.		SHEET METAL TOOL BOX		DRAWING IN ISOMETRIC - isometric views from given oblique & orthographic views.	
22	BASIC CHEMISTRY - kinetic molecular theory of gases.		PARALLEL KEY		DRAWING IN ISOMETRIC - isometric views from given oblique & orthographic views.	
23	BASIC CHEMISTRY - electrolysis and corrosion.		GIB HEAD KEY, WOODRUFF KEY		SECTIONAL VIEWS - sectional views from given orthographic views and print reading.	
24	BASIC CHEMISTRY - activity series of metals, Halogen elements.		PISTON PIN - FITTING		SECTIONAL VIEWS - sectional views from given orthographic views and print reading.	
TERM 3						
25	MATERIALS - metals, plastics, properties related to refrigeration. Calculations, volumes. Use of material quantity tables.		SHAFT SEAL - RECONDITION		WELDING	2HPW FOR 12 WEEKS
26	REFRIGERANTS - common refrigerants, properties, precautions in handling. First aid directions.		VALVE PLATE - RECONDITION		OXY WELDING - setting up, safety factors, flame control, closing down, joining leads.	
27	REFRIGERANTS - colour coding refrigerant numbering system.		SERVICE VALVES - RECONDITION		OXY WELDING - molten pool, use of filler rod, butt weld down hand 1.5mm, 2.5mm plate.	
28	REFRIGERANTS - refrigerators and breathing apparatus.		GASKET SET - CUTTING		OXY WELDING - fillet weld 1.5mm, 2.5mm plate, horizontal (horizontal), vertical fillet weld.	
29	REFRIGERANTS - chemical names and formulae.		COMPRESSOR - ASSEMBLE AND TEST		OXY WELDING - fillet weld 1.5mm, 2.5mm plate, horizontal (horizontal), vertical fillet weld.	
30	REFRIGERANTS - leak detection.		COMPRESSOR - ASSEMBLE AND TEST		OXY WELDING - section vertical and fillet weld, corner welds on 2mm, 1.5mm M.S. plate.	
31	MOISTURE - entry of moisture into a system, effects of moisture in a system.		COMPRESSOR - ASSEMBLE AND TEST		OXY WELDING - section vertical and fillet weld, corner welds on 2mm, 1.5mm M.S. plate.	
32	MOISTURE - methods of detection, moisture indicators.		COMPRESSOR - ASSEMBLE AND TEST		OXY WELDING - demonstration oxy cutting by hand, braze welding 2.5mm, 1.5mm plate.	
33	MOISTURE - method of removal, heat, dry gas, high vacuum etc.		COMPRESSOR - ASSEMBLE AND TEST		OXY WELDING - braze welding 2.5mm, 1.5mm M.S. plate down hand.	
34	MOISTURE - dehydration, drying agents.		SERVICE CYLINDERS - CHARGING		OXY WELDING - braze welding of cast iron copper (brass, copper/lead).	
35	REVISION		METHODS OF LEAK DETECTION		ELECT. WELDING - safety rules to 8 gauge, connecting leads, job preparation, strapping an arc.	
36	YEARLY EXAMINATION		PRACTICAL TEST		ELECT. WELDING - DOWN HAND PAD.	

THE APPRENTICE needs comprehensive workplace experience in conjunction with this course to become a fully productive tradesman.

These charts have been prepared by The Metal Trades Industry Association of Australia with the permission of The Department of Industrial and Technical Education, Australian Society of Engineers, Amalgamated Metal Workers and Engineers Union, Electrical Trades Union of Australia, Industrial Mechanics, Refrigeration Training Officers Association, and the National Sheet and Engineering Training Committee.

The responsibility of these charts rest ultimately with the Government of Australia through the Department of Education and Industrial Relations.



As you can see from the slide, back in the old days, we had a trade course syllabus which had a variety of interesting material such as: calculations of volume, soft solder exercises, sheet metal tool boxes, filing exercises, behaviour on the job, and engineering drawing. We also had exams and practical tests throughout the year.

REFRIGERATION MECHANICS TRADE COURSE SYLLABUS GUIDE

STAGE 1
1977-78
APP-1
PER 2000

WEEK	REFRIGERATION THEORY	REFRIGERATION PRACTICAL	ELECTRICAL PRACTICE	ELECTRICAL THEORY CALCULATIONS, WIRING
1	CYCLE CONTROLS - thermostats, pressure coils, low high pressure range differential	BENCH TEST ADJUST - low pressure controls - high pressure controls	CABLE ENDS AND CONNECTIONS - preparation of	ELECTRICAL SAFETY - layout and electrical symbols
2	REFRIGERANT - thermostatic expansion valve, oil, applications, types	BENCH TEST ADJUST - dual pressure controls	SINGLE AND DOUBLE POLE switched circuits	ELECTRICAL THEORY - electrical quantities, units
3	REFRIGERANT - controls - expansion and principle of operation	BENCH TEST ADJUST - domestic thermostats, commercial thermostats	SERIES - switching of multiple loads, parallel switching, multiple loads	MATERIALS - single double pole switches
4	REFRIGERANT - controls - TX valves, capacities from manufacturers data sheets	BENCH TEST ADJUST - industrial thermostats	CONNECTIONS - use of voltmeter, ammeter, ohmmeter, megger	VOLTS, AMPERES, OHMS, COULOMBS - basic switching of loads
5	OTHER REFRIGERANT - capacity valves, float coil controls	BENCH TEST ADJUST - TX valves	OHM'S LAW by varying voltage and resistance	METALS - meaning, use of - parallel switching of multiple loads
6	OTHER CONTROLS - electronic liquid level controls, pilot operated TX King valves	BENCH TEST ADJUST - TX valves	WIRING - simple commercial system using isolating switches, fuses	OHM'S LAW, FUSES - correct simple design
7	EVAPORATORS - pressure, temperature controls, air cooling, liquid cooling	BENCH TEST ADJUST - automatic expansion valve, A.X.I. valves	ANALYSIS - of voltage drops, energy power consumption, single in series	BOOM ENERGY - shock - simple commercial system, thermistor, valve, fan, etc.
8	COOLING COILS - types, construction, adjustments, calculating capacities of bore	EVAPORATOR - determine effective heat transfer surface	WIRING - a hot wire relay to a dome	POWER - input for commercial system, air conditioning, heaters, multiple heaters, etc.
9	COOLING COILS - pipes given "U" factor	DISMANTLE REPAIR - service, line valves	WIRING - a current coil type starting relay to a dome	SERIES GROUPING - of resistances - sealed unit with hot wire relay
10	COOLING COILS - using data sheet capacities	DISMANTLE REPAIR - service, line valves	CIRCUIT WIRING - of commercial cool room, multiple F.D.C. - pump down cycle	PARALLEL - grouping of resistances - sealed unit with current coil type starting relay
11	DEFROSTING - automatic methods	DEFROST SYSTEMS - analysis	PRACTICAL TEST	THE SERIES - parallel circuit, fluorescent light circuit
12	DEFROSTING - manual methods	DEFROST SYSTEMS - analysis		CONTROL - systems associated with refrigeration - valve shut, thermostat, other controls, motor F.D.C.
				TERM ASSIGNMENT
13	COMPRESSORS - types and applications, special features	USE OF manifold gauges - start up and pump down a system	METRE BRIDGE	WHEATSTONE - bridge modulating motor - step down motor, leak detectors, cranks
14	COMPRESSORS - capacity of compressors (allowable refrigeration)	USE OF manifold gauges - start up and pump down a system	WIRING UP - alarm indicator circuit, pilot lamp, pressure temperature	POTENTIOMETER - type controls, associated controls, thermostats, expansion, pressure control
15	COMPRESSORS - displacement formulae, calculations	CHARGING a system - charge with refrigerant and leak test	WIRING UP - commercial system on pump down, manual start unloader	EFFECTS - of an electric current - circuit of system, pilot lamp alarm, pressure etc.
16	COMPRESSORS - capacity formulae, calculations	CHARGING a system - charge with refrigerant and leak test	WIRING UP - commercial system on pump down, manual start unloader	ELECTROMAGNETISM - electromagnetic operated controls
17	COMPRESSORS - use of refrigerant tables	EFFICIENCY TEST - compressor pumping test	HALF YEARLY ASSESSMENT	REVISION
18	HALF YEARLY EXAMINATION	MAINTENANCE - remove compressor valve plate, inspect and	WIRING UP - an automatic hot liquid defrost system	HALF YEARLY EXAMINATION
19	LUBRICATION METHODS	MAINTENANCE - cut new gaskets and replace	WIRING UP - an automatic hot liquid defrost system	ALTERNATING - current, basic alternating generated, effective values, current voltage
20	CAPACITY CONTROL Cylinder Unloading	MAINTENANCE - replace compressor shaft seals	WIRING UP - an automatic hot liquid defrost system	CAPACITORS - paper types, electrolytic types, electronic hot, liquid dielectrics
21	WET DRY - COMPRESSION	MAINTENANCE - recharge liquid line drier on a system	WIRING CIRCUIT - of time switched, time terminated, defrost system	CONCEPTS - capacitive reactance, inductive reactance
22	LUBRICANTS - specifications compressor oils, lubricating problems	MAINTENANCE - change oil in a refrigeration system	WIRING UP - rapid circuit, time initiated, temperature terminated	PHASE - A.C. power
23	LUBRICANTS - oil refrigerant problems, oil type, selection	MAINTENANCE - change oil in a refrigeration system	WIRING UP - a star connected 3 phase motor on manual start	RELATIONSHIP - impedance, power factor
24	LUBRICANTS - precautions in handling oil safety controls	MAINTENANCE - bench test on safety controls	WIRING UP - a star connected 3 phase motor on manual start	POLYPHASE - systems, phase relationships, star connected motors, line phase voltages, connected motors, 3 phase power, line current phase current
25	CONDENSERS - types, applications, calculate capacities, "U" factor	REPEP - a refrigeration system	INDIVIDUAL - supplementary work after review of previous work	TRANSFORMERS - single, two windings - reverse ratio, defrost diagram
26	CONDENSERS - absorptive, recirculating	REPEP - a refrigeration system	STRIP DOWN - overhaul, reassemble electric motors	ELECTRIC - motors, polyphase, split phase motors, capacitor start motors
27	CONDENSERS - water control valves, capacities from data sheets	DEHYDRATE - a system using high vacuum methods	REVERSE DIRECTION of split phase motors	CAPACITOR - run motors, shaded pole motors, restart of motors
28	CONDENSERS - purging methods, capacities from data sheets	DEHYDRATE - a system using high vacuum methods	BRAND "A" Contactor - diamonds, identify	STARTING - devices, relay, coils, hot wire - sealed unit with potential relay
29	CONDENSERS - liquid motor, pump down gauges	ADJUSTING CONTROLS - adjusting pressure controls expansion valve	BRAND "B" Contactor - diamonds, identify	MOTOR - connection, D.O.L. starters - 3 phase motor with L.P.C. D.O.L. starter
30	AUTOMATIC CONTROLS - evaporator pressure, condenser pressure	REMOVING MOTORS - remove motor for servicing, test and alignment	BRAND "C" Contactor - diamonds, identify	STAR DELTA starters - 3 phase motor with stop start button
31	AUTOMATIC CONTROLS - refrigerant distributors, control valves	OIL TESTS - lubrication oil tests, viscosity, resistance, etc.	WIRING UP - an auto reset time delay overload contactor	OVERLOAD protection - two 3 phase motors with D.O.L. contactor, identical
32	AUTOMATIC CONTROLS - pilot operated valves, timing controls	CONDENSING - chamber flow and parallel flow	USING TEST EQUIPMENT on various types components, circuits	SERVICE EQUIPMENT - test lamps, shunters, test leads
33	AUTOMATIC CONTROLS - pressure relief valves, float switches	EVAPORATOR PRESSURE regulators - test, adjust	SERVICE PROCEDURES and fault finding exercises	SERVICE PROCEDURES - fault finding
34	REVISION	CRANKCASE PRESSURE regulators - test, adjust	DEMONSTRATION refrigeration controls, applications	INTRODUCTION - slides, television, video controlled rectifiers
35	REVISION	SOLENOID REVERSING VALVES - TESTING	REVISION	REVISION
36	YEARLY EXAMINATION	WATER VALVES - installing, setting, adjusting	YEARLY EXAMINATION	YEARLY EXAMINATION

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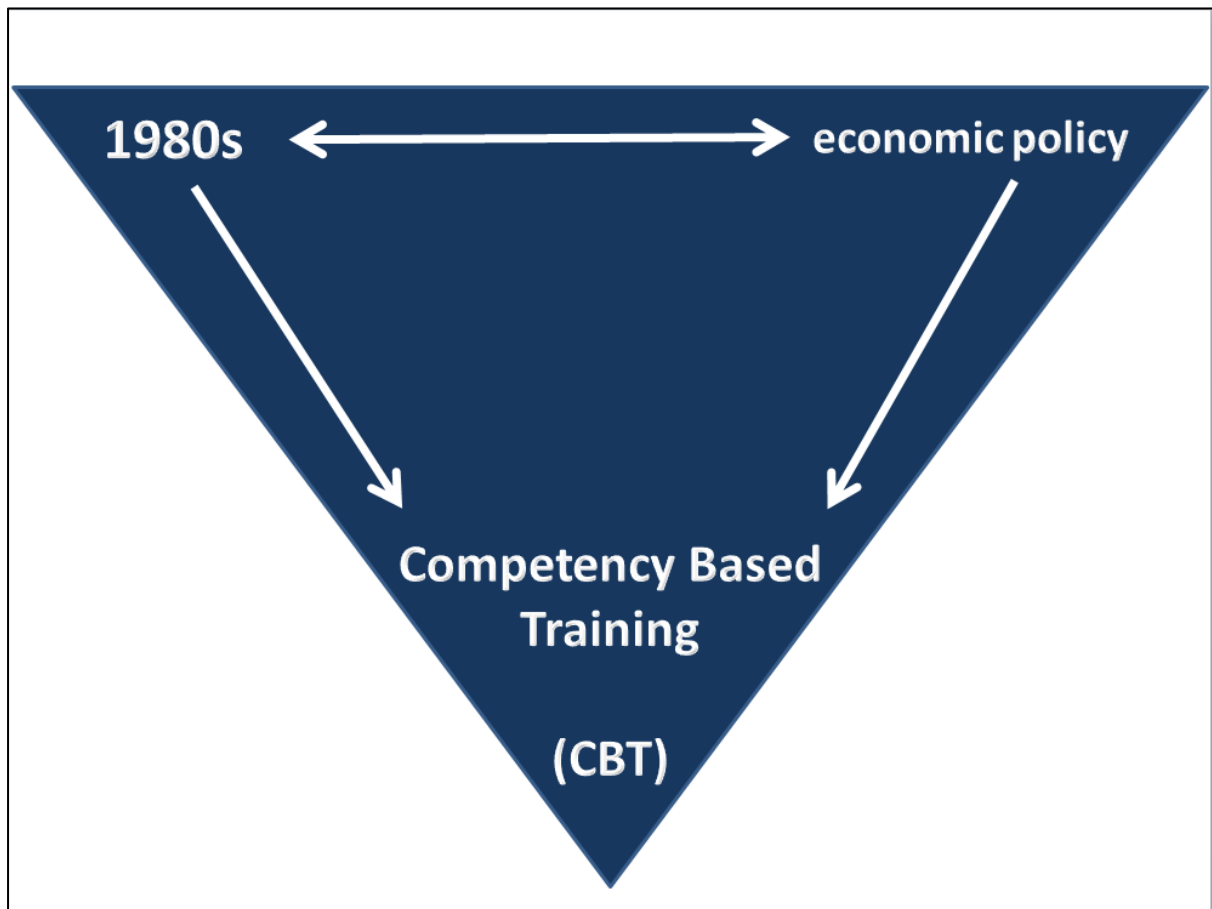
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After that we progressed to stage 2 to learn more and gain skills on wiring up, compressors, lubricants, servicing systems, as well as having to complete more exams and practical tests.

REFRIGERATION MECHANICS		TRADE COURSE SYLLABUS GUIDE		STAGE 1 1977-78
WEEK	THEORY OF APPLIED REFRIGERATION AND AIR CONDITIONING	SHOP REFRIGERATION, AIR CONDITIONING SYSTEMS LAYOUT	ON-PUMP REFRIGERATION PRACTICAL	STAGE 2
TERM 1 FEB TO MAY	1 COOLING TOWERS - use of psychrometric chart, fan performance curves, brine	SHEET LAYOUT AND SYMBOLS	TO DETERMINE THE QUANTITY OF WATER USED BY A COOLING TOWER	
	2 PIPING - design, materials, pipe size by velocity method and by calculations	FACTORY VIEWS OF RECOMMENDED PIPING ARRANGEMENTS	TO MIX A BRINE AND TEST ITS FREEZING POINT AND ITS pH	
	3 COLD ROOMS - capacity, relative humidity, condensation, insulation, heat leakage	SYSTEM USING SECONDARY REFRIGERANT	TO DETERMINE PRESSURE DROP THROUGH PIPES AND PIPERIG FILL EXPANSIONS	
	4 STORAGE CONDITIONS - design load storage, food preservation, recommended storage conditions, product load	TWO COLD-ROOM MULTIPLE SYSTEM	TO DETERMINE THE HEAT LEAKAGE INTO A COLD ROOM	
	5 DOMESTIC REFRIGERATION - types, electrical circuits, air charge, load calculations	INDUSTRIAL SYSTEM WITH WATER DEFROST	TO DETERMINE THE RELATIONSHIP BETWEEN HUMIDITY AND RELATING COOLING	
	6 COMMERCIAL APPLICATIONS - butcher block, vegetable, small goods, shops, instantaneous load calculations	COMMERCIAL SYSTEM WITH THE COLD LIQUID DEFROST	TO REPLACE THE LIQUID, EVACUATE AND RECHARGE A DOMESTIC REFRIGERATOR	
	7 SUPERMARKET APPLICATIONS - total load using safety factors and running time factors	COMMERCIAL SYSTEM WITH REVERSE CYCLE DEFROST	REPAIRS TO SUPERMARKET EQUIPMENT - Fit different element and expansion valves	
	8 HOTEL AND CLUB APPLICATIONS - beverage cooling	COMMERCIAL SYSTEM WITH HOT LIQUID DEFROST	INDUSTRIAL VISIT TO SUPERMARKET INSTALLATION	
	9 REFRIGERATED TRANSPORT, DAIRY REFRIGERATION	ELECTRICAL CIRCUIT FOR HOT LIQUID DEFROST SYSTEM	TO CARRY OUT A BEVERAGE INSTALLATION plants and copper lines	
	10 LOW TEMPERATURE APPLICATIONS - Equipment and systems. Mutual diagram calculations	PIPING ARRANGEMENTS, DOMESTIC REFRIGERATOR	ANALYSE AND OPERATE A COMPOUND SYSTEM	
	11 ABSORPTION SYSTEMS - DOMESTIC AND INDUSTRIAL, LITHIUM BROMIDE	ELECTRICAL CIRCUIT, DOMESTIC REFRIGERATOR	ANALYSE AND OPERATE A CASCADE SYSTEM	
	12 CODES - S.A.A. REFRIGERANT CODE AND OTHER RELEVANT CODES	TYPICAL DELICATESSEN PIPING ARRANGEMENT	ANALYSE AND OPERATE A LIQUID RE-CIRCULATING SYSTEM	
TERM 2 JUNE TO AUG	13 SERVICE ANALYSIS - gases, coil temperatures, pressures, operation, compressor calculations	SUPERMARKET PIPING CIRCUIT	TO ANALYSE THE OPERATION OF A CORRECTLY OPERATING SYSTEM	
	14 SERVICE LITERATURE - include charts, manufacturer's manuals, data sheets, effect of heat exchangers on systems	PIPE CIRCUIT OF A HOTEL OR BAR INSTALLATION	TO ANALYSE THE OPERATION OF A SYSTEM WITH VARIOUS FAULTS	
	15 ELECTRICAL COMPONENT SERVICING - parts, wires etc., test cable size, contact setting, current meter	PIPE CIRCUIT OF A BULK MILK VAT	TO DISMANTLE AND RE-ASSEMBLE CONTACTORS, relays etc. to test their operation	
	16 SERVICING ELECTRIC MOTORS - motor windings, repair, voltmeter readings, servicing capacitors, motors	INDUSTRIAL SYSTEM WITH FLOODED EVAPORATOR SYSTEM and Booster Pump	INDUSTRIAL VISIT TO A BEVERAGE COOLING APPLICATION	
	17 SERVICING HERMETIC Motor Burnouts - test of failure, service procedure, power measurements, electric defrosts	TWO STAGE SYSTEM	ANALYSE THE EFFECTS OF OPEN CIRCUITS ON SEALED UNITS	
	18 HALF YEARLY EXAMINATION	CASCADE SYSTEM	TO ANALYSE THE OPERATION OF A SYSTEM - UNDERCHARGED OVERCHARGED	
	19 METHODS OF CHARGING REFRIGERANTS - sealing with components, scale filling capacity	ELECTRICAL CIRCUIT, CASCADE SYSTEM	TO ANALYSE THE OPERATION OF A SYSTEM CONTAINING FOUL GAS	
	20 SERVICING DOMESTIC SYSTEMS - servicing open type units - quick estimate load forms, graphical method for balance	LIQUID AMMONIA RE-CIRCULATION SYSTEM	TO DETERMINE THE EFFECTS OF VARYING THE AIR FLOW THROUGH CONDENSERS	
	21 SERVICING EXPANSION VALVES - T.X., A.K., high side, low side float valves, pressure equalizers	LITHIUM BROMIDE ABSORPTION SYSTEM	ANALYSE THE EFFECTS OF VARYING LOADS ON A.X. and T.X. VALVES	
	22 SERVICING COLD ROOMS	ELECTRICAL CIRCUIT - using single contact control to perform opposite operations	SETTING CONTROLS ON COLD ROOMS TO ACHIEVE DESIRED CONDITIONS	
	23 SERVICING BAR EQUIPMENT	ELECTRICAL CIRCUIT OF A CYCLE DEFROST SYSTEM USING A TIME CLOCK	SERVICE AND ADJUSTMENT TO HOTEL AND CLUB EQUIPMENT	
	24 SERVICING SUPERMARKET EQUIPMENT	DETAIL OF S.A.A. REFRIGERATING SYSTEMS	SET CONTROLS AND CHECK DEFROST AND AIR PATTERN in supermarket equipment	
TERM 3 SEPT TO	25 FUNDAMENTALS OF AIR CONDITIONING - use of air-water vapour tables, calculations relative humidity	AIR CONDITIONING (A.C.) USING DIRECT EXPANSION (D.C. COIL	TO DETERMINE THE AIR CONDITIONS AT VARIOUS LOCATIONS - Psychrometer and charts	
	26 FUNDAMENTALS OF AIR CONDITIONING - use the psychrometric chart to find conditions of air gases	ROOM AIR CONDITIONER USING REVERSE CYCLE	TO DETERMINE THE EFFECTS ON R.H. BY CHANGES IN TEMPERATURE	
	27 HEATING AND HUMIDIFYING EQUIPMENT - power requirements for humidifying equipment	A.C. SYSTEM USING D.E. COIL AND HEATING COIL	TO ANALYSE THE PERFORMANCE OF A HUMIDIFIER	
	28 COOLING AND HUMIDIFYING EQUIPMENT - capacity of refrigeration equipment	A.C. SYSTEM WITH PREHEAT COILS, REHEAT COILS AND CHILLED SPRAY	TO INVESTIGATE THE REFRIGERATION AND ELECTRICAL circuits of a window type air conditioner	
	29 INSTRUMENTS - calculation of air velocity using total, static and velocity pressures	A.C. SYSTEM WITH COOLING COIL FACE AND BY-PASS DAMPERS	TO USE AND LEARN TO READ ACCURATELY INSTRUMENTS used in air conditioning	
	30 AIR CONDITIONING SYSTEMS - ventilation requirements, noise drafts, air circulation	A.C. SYSTEM WITH SPLIT D.E. COILS	DETERMINE THE PATTERN OF AIR MOVEMENTS BY SMOKE INDICATORS	
	31 AIR CONDITIONING SYSTEMS - use of psychrometric charts to determine resultant conditions	A.C. SYSTEM WITH COOLED COIL AND ZONE REHEAT COILS	MEASURE AIR VOLUMES THROUGH DUCTS AND OUTLETS	
	32 AIR CLEANING FANS - theory, electronic clearing, calculations using 3 fan laws	A.C. DUAL DUCT SYSTEM WITH HOT AND COLD WATER COILS	TEST A FAN AND RELATE THE RESULTS TO THE FAN LAWS	
	33 AIR CONDITIONING CONTROLS - temperature controls, air flow filter, safety controls	A.C. SYSTEM WITH PREHEAT COIL, COOLING COIL SUPPLYING units with cooling, heating coils	INDUSTRIAL VISIT TO LARGE AIR CONDITIONING DUCTED SYSTEM	
	34 COMMISSIONING - final checks, adjustments, air balancing	ELECTRICAL CIRCUIT OF OIL PROTECTION CONTROL SYSTEM	TO AIR BALANCE AN AIR CONDITIONING DUCTED SYSTEM	
	35 REVISION	REVISION	OPERATE AND ANALYSE AN AUTOMOBILE AIR CONDITIONING SYSTEM	
	36 FINAL EXAMINATION	REVISION	REVIEW OF EXERCISES	

We would then conclude on learning about cold rooms, supermarket applications, how to analyse and operate a compound system, and of course undergo more exams and tests.

This was a great course and it produced some top quality tradesmen. All of a sudden we woke up and this was all gone, there was now competency based training, which we still have today.



So in the late 80s, competency based training or CBT was introduced to improve the skills level of the Australian workforce.

Competency based training, in theory, should improve the skills and make for quicker completion of apprenticeships, which in turn, is supposed to increase the number of tradesmen in our industry.

The major flaw in this theory is that we are not attracting the right calibre of apprentices to our industry and we all know why. We want our children to go to university, and as parents there is a sense of failure if this is not achieved.

Yet an apprentice can earn approximately \$130,000 during his training period, a uni student after their training has a debt of approximately \$50,000—that's a difference of \$180,000.

So why are we not attracting the right youth?

My thoughts on why we don't attract the right youth is that to be a fully competent tradesmen in refrigeration and air conditioning—to be able to fully understand a system and its sub cooling and superheating qualities, as well as having to gain electrical diagnostic skills and more, you need to have the same intelligence as someone doing a university course.

Talking to TAFE teachers around the country, I hear the same complaint— apprentices are not completing their off-the-job work and are resitting their capstone many times.

Why is this happening?

One idea is that the apprentice is not properly assessed before starting their trade. We need a national entrance exam that checks the numeracy, literacy and dexterity of a future apprentice. Tests like this were conducted 30 years ago.

Also, our industry is not promoted for what it is, we need to make it more sexy, more appealing to young people. We have promotional material that is sent to schools, but I wonder if it is actually shown to the children.

One of the main downfalls of competency based training is the ability of rogue Registered Training Organisations to deliver Certificate II courses in just a few hours.

The Certificate II split system course should be delivered in 360 hours, not 16 hours. I have spoken to many tradespeople about the Certificate II course and their main complaint is that you can obtain a Certificate II licence after a short course. However, they had no problem with people doing the course in the recommended 360 hours.

If it was compulsory that the course could only be delivered in the 360 hours then you would have very few people taking it up. I think the Certificate II Split System course should cease to be delivered. The Certificate II course has stopped people taking up the Certificate III course so it could be a possible reason for an industry shortage of trained tradespeople.

I have been in this industry for 50 years now and I am aware that a skills shortage has always existed. Most companies send their apprentices to TAFE or an equivalent however in NSW, TAFE training is in a real mess.

TAFE Training



I am aware that they are considering doing away with storeman, which may sound like a trivial thing but the storeman fulfil the flow of tools and equipment to make the days' training complete. If teachers have to take over the role of storeman, it then reduces their time teaching.

Another problem is that TAFEs are reducing the time an apprentice is required to attend in a year. I know some colleges have reduced required attendance from 36 to 30 weeks. Over the years more content has been added to the

course and nothing taken out, so how can they consider reducing the training times for an apprentice?



We all know we have the ARC licence and generally it works well. Most of the industry supports the ARC licence and the major complaints seem to come from the Certificate II courses, which I have spoken about. There are complaints that Certificate II people are going beyond their licence limit. I have even heard of Certificate II people installing cool rooms. What ARC needs to do

to retain its good will is to be able to check and make sure that everyone is working within the scope of their licence.

Certificate II people need to be audited and they need to prove they have vacuum pump leak detector and recovery unit.

ARC tends to get blamed for all the problems with licensing but I can say that they are working on improving the situation, and most of the blame is unfounded.

The majority of the industry is supportive of occupational licensing, not just environmental licensing which ARC is.

If you look at state licensing it is so diverse.

Licensing—State by State



QLD has the Refrigeration, Air Conditioning and Mechanical Services Licence, which has Limited and Unlimited Design classes. They also have the Air Handling Duct Installation Licence and the Restricted Electrical Licence.

NSW has Contractors and Supervisors licences for refrigeration and air conditioning work, which only Certificate III qualified people can get. There is no recognition of Certificate II in NSW. I wish the whole country adopted this

system. The NSW Government have made it known that they would like to see the state licence gone.

The ACT has the Restricted Electrotechnology Systems—Refrigeration and Air Conditioning Licence, which is a class under the Construction Occupation Licence.

In Victoria, you must hold a Restricted Electrical Workers Licence and a Victorian Building Authority Plumbing Licence.

In Tasmania, you need a Restricted Electrical Work (REW) Licence, which falls under the Plumber Practitioner Licence.

In the Northern Territory, you must hold a Restricted Electrical Licence and in South Australia, you must have a Restricted Electrical Workers Licence and a Building Work Contractors/Supervisors Licence.

Finally in WA, you will need a Restricted Electrical Licence.

As you can see there is no uniformity between the states, except the restricted electrical licence and even then these are different in what work you are permitted to carry out.

In South Australia, you can carry out the interconnecting wiring between indoor and outdoor, but no mains. The industry needs to pursue this for all states.

We will never be able to wire the mains as this is not covered in our trade course but the interconnecting should be achievable.

Refrigerants and training



With the new refrigerants comes more challenges for our trade:

Ammonia—is slowly growing and requires more available training.

CO₂—has had a rapid rise in uptake and is not the mysterious refrigerant it was 10 years ago.

HFOs—will soon be here and being mildly flammable, it requires the workforce to be competent.

Hydrocarbons—are growing and require training.

R32—is plentiful and the training course is up before the IRC to review and sign off.

As you can see a lot of training is required for our industry, but if we can't attract the right apprentices, they will struggle to become competent.



In conclusion, I would like to see:

- Our industry profile lifted.

- A test to make sure new applicants for apprenticeships have the basic skills to be able to complete their apprenticeship.
- TAFEs and RTOs to stop delivering the Certificate II course and cease with the cost cutting measures.
- National licensing—this is a tough one, but let's try and get national consistency plus achieve the interconnecting wiring for all states.
- I would also like to make sure that training is in place for all refrigerants.

Refrigeration and air conditioning is a great trade.

Thank you.