

NATIONAL SKILLS COMPETITION

Competitions Sub-Committee

**REFRIGERATION**

(IMR#3)

**Table of Content**

<b>1. NAME AND DESCRIPTION OF TRADE.....</b>	<b>2</b>
1.1.1. Refrigeration.....	2
<b>2. SCOPE OF WORK AT COMPETITIONS.....</b>	<b>2</b>
<b>2.3 PRACTICAL WORK.....</b>	<b>3</b>
<b>3. SKILL MANAGEMENT PROCEDURES (SM).....</b>	<b>3</b>
3.1. DOCUMENTS REQUIRED.....	3
3.2. PRE-COMPETITION RESPONSIBILITIES.....	4
3.3. SKILL MANAGEMENT PROCEDURES FOR THE CHIEF EXPERTS.....	4
3.4. HONESTY AND TRANSPARENCY.....	8
3.5. INFORMATION POLICY.....	9
<b>4. THEORETICAL KNOWLEDGE.....</b>	<b>10</b>
<b>5. MATERIALS.....</b>	<b>10</b>
<b>6. WORKSHOP INSTALLATIONS.....</b>	<b>10</b>
<b>7. TEST PROJECT MARKING.....</b>	<b>13</b>
7.2 MARKS:.....	13
7.3 RATING.....	14
<b>8. COMPETITION PROCEDURE.....</b>	<b>14</b>
<b>9. JUDGING PROCEDURAL REQUIREMENTS.....</b>	<b>15</b>
<b>10. GENERAL SAFETY REQUIREMENTS.....</b>	<b>15</b>

NATIONAL SKILLS COMPETITION

Competitions Sub-Committee

**REFRIGERATION**

(IMR#3)

# NATIONAL SKILLS COMPETITION

Competitions Sub-Committee

## **REFRIGERATION**

(IMR#3)

### **INTRODUCTION**

WorldSkills Jamaica , by a resolution of the National Organizing Committee and in accordance with the Constitution, the Standing Orders and the Competition Rules, has adopted the following minimum requirements for this skill for the National Skills Competition.

The Technical Description consists of the following:

- Section 1 – Technical/Competition Description (TD)
- Section 2 – Project Design Criteria (PD)
- Section 3 – Skill Management Procedures (SM)
- Section 4 – Workshop Setup (WS)
- Section 5 – Infrastructure List (IL)
- Section 6 – Appendices

Effective 01.04.07

Grace Mclean (GM)

Chairman, Competition Committee

01.04.07

Co-chair

Daphne Simmonds

# NATIONAL SKILLS COMPETITION

## Competitions Sub-Committee

### **REFRIGERATION**

(IMR#3)

The National Skills Competitions Sub-Committee has adopted the following minimum requirements for applicants' entry in the Skills Jamaica Competition.

The effective date will be that date on which this document is issued, and is subject to change by the National Skills Competition Steering Committee.

## **1. NAME AND DESCRIPTION OF TRADE**

1.1 The name of the trade is:

### **1.1.1. Refrigeration**

1.2 The refrigeration technician deals with the installation, maintenance, fault finding and repair of refrigeration systems which transfer heat by means of the vapour compression refrigeration cycle; e.g. refrigeration systems as applied to cool rooms, freezer rooms, air-conditioning systems, liquid coolers and heat pumps.

Systems must operate on a commonly used HFC and/or HCFC refrigerant.

1.3 This technical description must be known to every competitor.

1.4 Words implying masculine gender only shall include the feminine gender

## **2. SCOPE OF WORK AT COMPETITIONS**

2.1 The work at the competition is practical work as described in section 3 below.

# NATIONAL SKILLS COMPETITION

## Competitions Sub-Committee

### **REFRIGERATION**

(IMR#3)

2.2 The theoretical knowledge necessary to carry out the practical work as described in section 4 below.

### **2.3 PRACTICAL WORK**

3.1 The competitors must be able to carry out the following tasks with his working skills:

- Installation of refrigerant piping.
- Installation and setting of controls and regulating devices.
- Installation and commissioning of complete systems.
- Charging, recovering and transferring refrigerants.
- Draining and refilling compressor lubricant.
- Electrically connecting the components and testing the circuits.
- Troubleshooting and repairing systems.
- Replacing components.
- Measuring and recording system operating parameters.
- Interpreting manufacturers operating manuals, piping diagrams and
- Electrical diagrams.
- Filling in a materials list from system specifications and
- Drawings/diagrams.

## **3. SKILL MANAGEMENT PROCEDURES (SM)**

### **3.1. DOCUMENTS REQUIRED**

3.1.1 The Chief Expert will have available a current copy of all documents associated with this skill for the Competition.

3.1.2 The documents required are:

- Technical Description
- Competition Rules

# NATIONAL SKILLS COMPETITION

## Competitions Sub-Committee

### **REFRIGERATION**

(IMR#3)

- Health and Safety documents
- QAMS – all documents
- Any other documents referred to in the documents listed above.

3.1.3 While it is understood that the Chief Expert will have a copy of these documents in there shall also be a complete set that is available for the experts and other competition workers.

3.1.4 The Chief Expert is expected to have a sound knowledge of the requirements and procedures specified in the documentation.

3.1.5 The Jury President is expected to have a thorough knowledge and understanding of the requirements and procedures specified in the documentation.

### **3.2. PRE-COMPETITION RESPONSIBILITIES**

3.2.1 In the period between one National Skills Competition and the next, the elected Chief Expert is responsible to ensure that the requirements of Section 2 – Project Design Criteria are complied with.

### **3.3. SKILL MANAGEMENT PROCEDURES FOR THE CHIEF EXPERTS**

The following speaks to the procedures prior to and during the Competition

3.3.1 The procedures specified below must be adhered to.

3.3.2 On arrival at the Competition site for the first time, the Chief Expert must:

- Welcome the experts and ensure introductions are made
- Inform them of their duties and responsibilities in terms of the Competition Rules and Standing Orders
- Ensure that the project is endorsed by all the experts and that a copy is signed by all the experts

## NATIONAL SKILLS COMPETITION

### Competitions Sub-Committee

#### **REFRIGERATION**

(IMR#3)

3.3.3 The Chief Expert will then divide the experts into teams for the following activities:

- Verify that the material on site is appropriate and sufficient
- Verify again that the quantities of material as specified on the material list is accurate
- Develop a program for the competitors to complete the modules
- Develop timetables for activities
- Set up equipment
- Confirm that the layout, work areas and equipment are in accordance with the workshop setup requirements
- Confirm that all machinery/equipment is in a safe working order
- Confirm that all workstations/machinery/equipment are in accordance with the plan, and that they are numbered
- Confirm that there is sufficient illumination
- Confirm that there is sufficient space for the competitors to work efficiently
- Confirm that the barriers are far enough removed from the competitors to ensure that there will be no interference, and if they are not, set up a roster among the experts to police the area during the Competition
- If necessary, set up duty rosters for activities during the Competition – e.g. keeping watch during lunch, preventing access of unauthorised persons, etc

3.3.4 The Chief Expert will then divide the experts into teams for purpose of marking and setting up marking schedules in accordance with the requirements.

3.3.5 Suggestions and comments for the revision and improvement of the Technical Description are to be provided to the Deputy Chief Expert in writing. The Deputy Chief Expert will reduce the information to a single typed document ready for discussion by all experts. Prior to leaving the

## NATIONAL SKILLS COMPETITION

### Competitions Sub-Committee

#### **REFRIGERATION**

(IMR#3)

Competition site, the Chief Expert, the Deputy Chief Expert and the Jury President will facilitate the discussion and revision of the Technical Description.

- 3.3.6 At any time that a unanimous decision is not achieved within a reasonable time, the Chief Expert will put the matter under discussion to the vote. A majority will be 50% of the experts present plus one. This decision will be final. In the event that an expert is absent at the time that the vote takes place, he/she has the right to be informed of the decision but the matter will not be raised again or voted upon again. The exception to this majority rule will be in the case of approval of the changes to the Technical Description, where the majority of 80% is required.
- 3.3.7 In the event that an extension of time is requested for the Competition to exceed the allotted hours, the matter must be discussed with the Jury President. All possible alternative solutions must be investigated before approval of an extension of time is requested, or will be approved.
- 3.3.8 Prior to the end of the Competition, the Jury President will facilitate the selection of the Chief Expert and Deputy Chief Expert for the next national Skills Competition.
- 3.3.9 Experts are eligible for selection as a Chief Expert if they:
- Have attended the National Skills Competition at least twice before (if less than 4 experts have been to the National Skills Competition before, this criterion may be relaxed at the discretion of the Jury President)
  - Demonstrate a high degree of expertise in the skill
  - Demonstrate leadership qualities.
  - Are competent using a computer and the Internet – specifically to facilitate the Discussion Forum for their skill category.
- 3.3.10 The process by which selection will take place is by secret ballot and is as follows:

## NATIONAL SKILLS COMPETITION

### Competitions Sub-Committee

#### **REFRIGERATION**

(IMR#3)

- Each expert present will list their choice of three experts in order of preference • The Jury President will allocate a score of three (3) points to each experts first preference, two (2) points to the second preference and one (1) point to the third preference
  - The Jury President will then calculate total scores and announce the three highest scoring experts
  - The expert with the highest score will be appointed Chief Expert for the next National Skills Competition
  - If the first choice cannot attend, then the second choice will be Chief Expert
  - If the first and second choice cannot attend, then the third choice will attend
  - If none of the choices can attend, then the jury president will appoint, or facilitate the appointment of a Chief Expert
  - The names of the selected experts will be entered into the provided documentation and signed by the Jury President and returned to the co-chair of the competitions committee.
- 3.3.11 Changes to the method of Competition design or suggestions offered for the next Competition design process or tasks must be written down and signed by 80% of the experts.
- 3.3.12 The Deputy Chief Expert's primary role is to ensure that the Technical Description is updated to reflect the technological advances of the skill category and include overall improvements for the preparation and running of the Competition. He/she will ensure that all changes to the Technical Description are entered, that all experts sign it, and that it is delivered to the co-chair of the competitions committee as a hard copy and digitally.

## NATIONAL SKILLS COMPETITION

### Competitions Sub-Committee

#### **REFRIGERATION**

(IMR#3)

3.3.13 The Deputy Chief Expert also assists in the distribution and collection of the QAMS Audit Questionnaires and assists the Chief Expert where necessary.

### **3.4. HONESTY AND TRANSPARENCY**

3.4.1 The competitors that attend the National Skills Competition have the right to expect fair and honest treatment during the Competition in terms of the following:

- Instructions that are clear and unambiguous
- Marking schedules that provide no advantage to an opposing competitor
- All necessary equipment and material specified within the skill documentation that are required to complete the Competition
- The assistance necessary from judges and officials to ensure that he is able to complete the project. (The assistance deemed necessary will be provided equally and at the same time to all competitors present)
- No undue interference by officials or spectators that may hinder them in the completion of their project

3.4.2 Every competitor has the right to expect and demand that no opposing competitors will receive undue or unfair assistance or intervention that may provide that opposing competitor with an unfair advantage.

3.4.3 All officials and judges present on the Competition site are expected to ensure that paragraphs 3.4.1 and 3.4.2 above are complied with and maintained.

3.4.4 It is the responsibility of the Chief Expert or his Deputy to ensure that all competitors, interpreters, officials and judges comply with and maintain

## NATIONAL SKILLS COMPETITION

### Competitions Sub-Committee

#### **REFRIGERATION**

(IMR#3)

the integrity of the Competition, and additionally ensure that all necessary steps are taken to ensure that:

- Outside influences do not unduly improve or decrease competitors' abilities to provide a worthy performance.

3.4.5 A briefing will be provided to all experts and competitors on the requirements for integrity during the Competition.

3.4.6 Additionally, the Chief Expert is expected to identify these and any other factors that may exist on the Competition site that may result in the contravention of paragraphs 3.4.1 and 3.4.2 above, and reduce them to a checklist for continuous reference.

3.4.7 In the event that any competitor, judge, official, observer or competitor compatriot is found to be attempting to gain or provide assistance in any form that may result in an unfair advantage, the Chief Expert is to immediately refer the matter to the Jury President.

3.4.8 The Chief Expert will receive nominations and appoint a Security Officer whose responsibility it will be to ensure that these requirements are carried out.

3.4.9 It will be explained to all experts and competitors that nothing is to come in or out of the site unless specified by the Chief Expert as being allowed after being briefed on this topic.

3.4.10 Security checks will be carried out each day on experts and competitors (by experts and competitors) upon entry and exit to the site.

#### **3.5. INFORMATION POLICY**

3.9.1 During the competition a modified project plan without measurements is to be made available to the public.

# NATIONAL SKILLS COMPETITION

## Competitions Sub-Committee

### **REFRIGERATION**

(IMR#3)

#### **4. THEORETICAL KNOWLEDGE**

- 4.1 - Identification and utilisation of materials, components and tools.
- All theoretical knowledge required to carry out the practical work.

#### **5. MATERIALS**

- 5.1 Commercially available or domestic components, controls and regulating equipment may be used.

#### **6. WORKSHOP INSTALLATIONS**

- 6.1 The workplace for the competition must be suitable for the number of competitors and the layout must be suitable for the projects selected.

- 6.2 Each competitor must be provided with a workstation, which must be suitable for the projects selected.

- 6.3 The competitors must use the following machinery and equipment supplied for the competition:

- Refrigerant recovery machine
- Vacuum pump
- Brazing and silver soldering equipment and materials.

Full operating manual, wiring diagrams and specifications of the major equipment will be submitted prior to the competition.

- 6.4 The following machinery and equipment will be supplied for each competitor:

## NATIONAL SKILLS COMPETITION

### Competitions Sub-Committee

#### **REFRIGERATION**

(IMR#3)

- All equipment, components and accessories required for the installation project must have a cooling capacity of approx. 1 kW at medium temperature for the cabinet and a cooling capacity of approx. 2 kW for the split air conditioner.
- Brazing and silver soldering equipment and materials.
- Workbench with vice.
- Project mounting support or panel, if required.
- Refrigerant.
- Pressure-temperature charts for the refrigerants used.
- A vacuum pump suitable for evacuating down to 50 Pascal absolute (or equivalent pressure), complete with vacuum gauge and spare oil.
- A regulated supply of dry nitrogen and regulator to supply a minimum pressure of 1000 kPa.
- All electrical hand tools as required for the projects.
- A suitable single-phase power supply.
- Suitable refrigeration oil.
- A lead light.
- An extension cable.
- An Oilcan
- Cleaning rags
- Emery cloth
- Steel wool

6.5 The competitors must, as a minimum, bring the following tools:

- 1 metal rule 300 mm.
- 1 protractor.
- 1 set square 90°.
- 1 spirit level 300 mm.

# NATIONAL SKILLS COMPETITION

## Competitions Sub-Committee

### REFRIGERATION

(IMR#3)

- 1 scribe.
- A 5 m steel measuring tape.
- 1 centre punch.
- 1 set screwdrivers 2 - 6 mm.
- 1 set crosshead (Phillips) screwdrivers.
- 2 adjustable spanners (250 and 300 mm).
- 1 set of spanners up to 25 mm and imperial up to 1`AF.
- 1 set of files: flat, half round and round.
- 1 gauge manifold and hoses.
- 1 vacuum gauge suitable for measuring down to 50 Pascal absolute (or equivalent pressure).
- 1 electronic leak detector for HFC and/or HCFC refrigerants.
- 1 small mirror.
- 1 Schrader valve spanner.
- 1 valve ratchet spanner.
- 1 set of tube mechanical benders, up to 5/8", all 180°.
- 1 set of bending springs, up to 5/8".
- 1 pipe reamer.
- 1 pipe cutter, up to 1 1/8".
- 1 pipe expander set, up to 5/8".
- 1 pipe flaring set, up to 5/8".
- 1 set twist drills 1 - 10 mm.
- 1 bull nose pliers.
- 1 long nose pliers.
- 1 pair wire strippers.
- 1 knife.
- 1 hacksaw and blades.
- 1 hammer, approx. 400 gram.

NATIONAL SKILLS COMPETITION

Competitions Sub-Committee

**REFRIGERATION**

(IMR#3)

- Personal safety clothing and equipment including long sleeve shirt
- Suitable instrumentation for measuring voltage, current and resistance.
- 1 insulation tester.
- 1 differential digital thermometer with at least 2 sensor probes.
- 1 set of writing implements, including coloured and highlighting pens.
- 1 Allen key set metric or imperial

**7. TEST PROJECT MARKING**

7.1 The experts will decide on the project, the marking criteria and the dimensional tolerances.

**7.2 MARKS:**

Perfect	=	10 points
Very good	=	9 points
Good	=	8 points
Rather good	=	7points
Sufficient	=	6 points
Medium	=	5 points
Weak	=	3 points
Very bad	=	2 points
Zero	=	1 point

# NATIONAL SKILLS COMPETITION

## Competitions Sub-Committee

### REFRIGERATION

(IMR#3)

#### 7.3 RATING

Section	Item	Maximum Points
A	Refrigeration Pipework	25
B	Electrical Wiring	10
C	Component & System Installation	10
D	Commissioning & Adjustment	20
E	Fault Finding	10
F	Repair and Part Replacement	10
G	Refrigerant Recovery and Emission Control	10
H	Safety	5

**Points will also be awarded for creativity, innovation, speed etc. (This will be developed by the judges depending on the nature of the test project).**

#### 8. COMPETITION PROCEDURE

8.1 Competitors will have time to familiarise themselves with equipment, material and work processes. When particular processes are particularly difficult, relevant demonstrations of the work processes will be arranged for the competitors.

8.2 The competitors will be given all competition documents including the test project questions, summary of marking scheme, detailed time table, equipment manuals one day before the commencement of the competition for study.

8.3 All competitors' work must be covered and must face the judges and visitors while working on the project.

## NATIONAL SKILLS COMPETITION

### Competitions Sub-Committee

## REFRIGERATION

(IMR#3)

### 9. JUDGING PROCEDURAL REQUIREMENTS

9.1 The experts that attend the competition will be divided into expert groups, with a group leader, to deal with and mark the individual questions of test project. The same expert group will mark all competitors for the same question.

9.2 The weighting of marks responsible by the expert groups should be equal as far as possible.

### 10. GENERAL SAFETY REQUIREMENTS

10.1 All competitors must use safety glasses when using any hand, power or machine tools or equipment likely to cause or create chips or fragments that may injure the eyes.

10.2 All competitors must wear appropriate clothing and footwear.

10.3 All competitors must wear hearing protection when necessary.

10.4 Competitors must keep their workspace clear of obstacles and the floor space clean of material and equipment - any items likely to cause the competitor to trip, slip or fall.

**10.5 Failure by the competitor to comply with safety directions or instructions may incur loss of marks for safety or penalties**

NATIONAL SKILLS COMPETITION

Competitions Sub-Committee

**REFRIGERATION**

(IMR#3)