Smart Classroom Design

Concept Note

September 2018

Background

Rwanda Vision 2020 aims at moving Rwanda from “an agriculture based economy to a knowledge-based society” and middle-income country by 2020. The use of ICT in education is considered an important strategy for achieving this transformation. This is also in line with the strategic goal of the ESSP to strengthen the relevance of education and training to the labour market including the insertion of 21st century skills. As stated in the ICT in Education policy, Rwanda’s Vision for ICT in Education is: “To harness the innovative and cost-effective potential of worldclass educational technology tools and resources, for knowledge creation and deepening, to push out the boundaries of education: improve quality, increase access, enhance diversity of learning methods and materials, include new categories of learners, foster both communication and collaboration skills, and build capacity of all those involved in providing education.”

ICT is used as a tool to enhance teaching and learning at all education levels, from primary to tertiary education. The Vision 2020 aims at transforming Rwanda into a knowledge-based,
technology-led and middle-income society by the year 2020. Information and Communication Technology (ICT) is considered as a ubiquitous tool that will energize the country’s socio-economic development. Enhancing teacher capabilities in and through ICT is one of the strategies used by the Government of Rwanda to develop a high-quality skills and knowledge base, leveraging ICT across various socio-economic sectors of the country.

The introduction of a competency-based curriculum in schools calls for comprehensive change and new thinking about instructional approaches in teaching, learning and assessment processes. The use of ICT in education is seen as a strategic lever for achieving this transformation. It is stated in the curriculum framework that: “The curriculum must enable educators and students to use ICT as a tool to improve the quality of education in all subjects at all levels in teaching and learning practices. ICT must support the emergence of teaching and pedagogical student-centered approaches as well as encourage research, communication, and collaborative learning.” ICT in Education policy aims at guiding the establishment of smart classrooms in schools as the main part of ICT in Education.

**Proposed Smart classrooms Seating Arrangement**

The physical setup of chairs, tables, and presentation in a classroom can significantly influence learning. Instructional communication theory suggests that seating arrangements can impact how the teachers communicates with students and how the students interact with one another, impacting engagement, motivation, and focus. More than 692 smart classrooms across the country have been set up in schools to improve the quality of teaching and learning. The details on the proposed smart classroom seating arrangement are below.

**Objectives**

- Standardizing existing smart classrooms to support 21st century learning
APPENDIX 1: Proposed Smart Classroom Seating Arrangement Referring to the classroom size standards.

Three options are considered:

1. Building new smart classroom (9/10 m) to accommodate 50 students
2. Merging two existing small classrooms (7/8 m) into one big classroom for smart classroom to accommodate 50 students
3. Remodeling existing small classroom (7/8) where building new or merging two classroom is not possible. The remodeled classroom will accommodate 30 students instead of 50 students.

1. Newly proposed smart classroom (9/10 meters) with 50 Laptops, back view
2. Newly proposed smart classroom (9/10 meters) with 50 Laptops, front view

3. Two merged existing (7/8 meters) classrooms to form one smart classroom with 50 laptops, back view
4. Two merged existing (7/8 meters) classrooms to form one smart classroom with 50 laptops, front view

5. Remodeling Existing smart classroom (7/8 meters) with 30 laptops instead of 50 laptops front view
6. Remodeling Existing smart classroom (7/8 meters) with 30 laptops instead of 50 laptops back view

7. Tables
8. Table
NEW SMART CLASSROOMS
50 COMPUTERS / SMART CLASSROOM
2 MERGED CLASSROOMS TO FORM 1 SMART CLASSROOM
50 COMPUTERS / SMART CLASSROOM

Typical Smart Classrooms
Seating Arrangement
All dimensions, in centimeters
Table Leg
Table Top
Table Horizontal Members
Table Side Wall
Table's Cables Holes
Undertable
Lockable Door
Student Chair

SMART TABLE DETAILS

SECTION 02 - 02

Cable's Hole
Door
Table Top
Shelf
Table Leg

102
+/70
+/40
+/36
+/8
+/0
PANEL BOARD NAME: 01-DP  
PANEL LOCATION: FRONT OF MULTIPURPOSE BUILDING  
PHASE TO NEUT: 220 VOLT  
MAIN BREAKER: 40A  
PHASE SINGLE, 3WIRE, 50HZ  
SURFACE MOUNTED

<table>
<thead>
<tr>
<th>WIRE &amp; CONDUIT</th>
<th>DESCRIPTION</th>
<th>CIRCUIT LOAD</th>
<th>CIRCUIT LOAD</th>
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<tr>
<td>3(1cX1.5mm²)Ø20mm</td>
<td>LIGHTING (DP/01)</td>
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<td>LIGHTING (DP/04)</td>
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TOTAL CONNECTED LOAD: 5470 VA
DEMAND FACTOR: 0.7
DEMAND LOAD (KVA): 3.8 kVA
TOTAL AMPERE: 17.4000 A
STANDARD BREAKER SIZE: 32 A

NOTE:
1. FOR BRANCH CIRCUIT AND FEEDER SIZE CALCULATION PLEASE REFER TO VOLTAGE DROP CALCULATION ON DESIGN ANALYSIS.
2. PANEL MAIN BREAKER SHALL BE RESIDUAL CIRCUIT BREAKER WITH OVER CURRENT (RCBO), SEE RCBO TECHNICAL SPECIFICATION IN THIS SHEET.

RCBO TECHNICAL SPECIFICATION:
- EN/IEC 61009
- Rating: 6,10,16, 20, 32, 40, 63, 80, 100 & 125A
- Breaking capacity: 6000A
- Rated Voltage: 220/400V A.C. 50Hz
- Breaker Type: Type AC
- Rated Tripping Current: 30mA
- Residual Current off time: <0.1S
- Operating Characteristics: Type B, Magnetic Operating 3 to 5 times in (Current Rating)
- No. of Poles: 1P+N+1 (module)
- Trip: Thermal/Magnetic release
- IP Rating: IP20
- Terminal Capacity: 16mm² - 16mm², 32-50A - 25mm², 10mm² - 15mm²
- Endurance Operations: 10,000 Electrical, 20,000 Mechanical
- Installation: Mounting on 35mm DIN rail
- Size: 17.5mm Width
- Standard Breaker Size: 32 A
- Terminal Torque: 2NM
- Enlargement: Electrical 10,000, Mechanical 20,000

NEW SMART CLASSROOMS
50 COMPUTERS / SMART CLASSROOM - DP SINGLE LINE DIAGRAM
**RCBO Technical Specification:**

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<tr>
<th>Standard(s)</th>
<th>EN/IEC 61009</th>
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<td>Rating</td>
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<td>Breaking capacity</td>
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<td>Rated Voltage</td>
<td>220/400V A.C. 50Hz</td>
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<tr>
<td>RCD Type</td>
<td>Type AC</td>
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<tr>
<td>Rated Tripping Current</td>
<td>30mA</td>
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<td>Residual Current off time</td>
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<td>Operating Characteristics</td>
<td>Type B: Magnetic Operating 3 to 5 times in (Current Rating)</td>
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<td>No. of Poles</td>
<td>1P=16A module</td>
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<tr>
<td>Trip</td>
<td>Thermal/Magnetic release</td>
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<td>IP Rating</td>
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<td>Terminal Capacity</td>
<td>6.5kN - 16mm², 32-50A - 25mm², 63-100A - 35mm², 125A - 50mm²</td>
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<tr>
<td>Terminal Torque</td>
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<td>Size</td>
<td>17.5mm Width</td>
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<tr>
<td>Endurance Operations</td>
<td>Electrical 10,000, Mechanical 20,000</td>
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</table>

**Power Riser Diagram:**

- **NSM-DP**
- **Min. BUSBAR RATE: 32A**
- **3(1x16mm²) Cu P.V.C./PVC+16mm² Cu GND**
- **10mm² BARE COPPER CONDUCTOR**
- **Ø100mm PVC CONDUIT**

**New Smart Classrooms**

- **50 Computers / Smart Classroom-DP Single Line Diagram**

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**NOTE:**

1. FOR BRANCH CIRCUIT AND FEEDER SIZE CALCULATION PLEASE REFER TO VOLTAGE DROP CALCULATION ON DESIGN ANALYSIS.
2. PANEL MAIN BREAKER SHALL BE RESIDUAL CIRCUIT BREAKER WITH OVER CURRENT (RCBO), SEE RCBO TECHNICAL SPECIFICATION IN THIS SHEET.
Panel Board Name: 02-DP
Panel Location: Front of Multipurpose Building
Main Breaker: 40A
Phased to Neut: 220 Volt
Single Phase, 3 Wire, 50 Hz
Min. Busbar Rate: 40A

WIRE, CONDUIT & DESCRIPTIONS

<table>
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<tr>
<th>Circuit No</th>
<th>Description</th>
<th>Circuit S Load</th>
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**TOTAL CONNECTED LOAD**: 5470 VA
**DEMAND FACTOR**: 0.7
**DEMAND LOAD (KVA)**: 3.8 KVA
**TOTAL AMPERE**: 17400 A

**STANDARD BREAKER SIZE**: 32 A

**POWER RISER DIAGRAM**

**RCBO Technical Specification**:

- **Standard(s)**: EN/IEC 61009
- **Rating**: 6, 10, 16, 20, 32, 40, 63, 80, 100 & 125 A
- **Breaking Capacity**: 6000 A
- **Rated Voltage**: 220/400 V A.C. 50 Hz
- **RCD Type**: Type AC
- **Rated Tripping Current**: 30 mA
- **Residual Current Off Time**: <0.1 S
- **Type B**, Magnetic Operating 3 to 5 times in (Current Rating)
- **No. of Poles**: 1P+N1 module
- **Trip**: Thermal/Magnetic release
- **IP Rating**: IP20
- **Terminal Capacity**: Mounting on 35 mm DIN rail
- **Size**: 17.5 mm Width
- **Endurance Operations**: Electrical 10,000, Mechanical 20,000

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**NOTE**:
1. For branch circuit and feeder size calculation please refer to voltage drop calculation on design analysis.
2. Panel main breaker shall be residual circuit breaker with over current (RCBO), see RCBO technical specification in this sheet.
PANEL BOARD NAME : 03-DP
PHASE TO NEUT: 220 VOLT
SURFACE MOUNTED

WIRE & CONDUIT & DESCRIPTIONS

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SUB - TOTAL IN ( VA )

5470 VA

DEMAND FACTOR

0.7

DEMAND LOAD (KVA)

3.8 kVA

TOTAL AMPERE

17,400 A

STANDARD BREAKER SIZE

32 A

POWER RISER DIAGRAM

NOTE:
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No. of Poles 1P+N+1 module
Trip Thermal/Magnetic release
IP Rating IP20
Terminal Capacity 6.0A - 16mm², 32-50A - 25mm²
Terminal Torque 2NM
Installation Mounting on 35mm DIN rail
Size 15.5mm Width
Endurance Operations Electrical 10,000, Mechanical 20,000

EXISTING SMART CLASSROOM

LIGHTING: 3(1cX1.5mm²) INSIDE 20mm PVC CONDUIT, P = 0.746kW

SOCKET: 3(1cX2.5mm²) INSIDE 20mm PVC CONDUIT, P = 0.900kW

SPARE 30mA
1P 32A
Min. BUSBAR RATE: 32A

10mm² BARE COPPER CONDUCTOR

100mm PVC CONDUIT

3(1cX16mm²) Cu P.V.C/PVC+16mm² Cu GND

0100mm PVC CONDUIT

3(1cX16mm²) Cu P.V.C/PVC+10mm² Cu GND