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
Wall Mounted Air Conditioner (A/C)

Windows Blind

Teacher’s Table

White Board

Ceiling Mounted Projector

Ceiling Mounted Projection Screen

5 Computers Table Set

Smart Classroom 3D Computers

IT Office

Stora / Technical Room

Wall Mounted Access Point

TYPICAL SMART CLASSROOMS
SEATING ARRANGEMENT
ALL DIMENSIONS, IN CENTIMETERS

2 Merged Classrooms to Form 1 Smart Classroom
50 Computers / Smart Classroom
**Panel Board Name:** 01-DP  
**Panel Location:** Front of Multipurpose Building  
**Main Breaker:** 40A  
**Phase to Neut:** 220 Volt  
**Single Phase, 3Wire, 50Hz**  
**Surface Mounted**  

**Wire, Conduit & Descriptions**

<table>
<thead>
<tr>
<th>Circuit &amp; Description</th>
<th>Wire &amp; Conduit</th>
<th>GND Wire</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lighting (DP/01)</td>
<td>3(1cX1.5mm²)Ø20mm</td>
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</table>

**Power Riser Diagram**

- **NSM-DP**
  - 3(1cX16mm²) Cu P.V.C/PVC+16mm² Cu GND
  - 10mm² Bare Copper Conductor
  - 8100mm PVC Conduit

**Notes:**
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.
3. Panel main breaker shall be residual circuit breaker with over current (RCBO), see RCBO technical specification in this sheet.

**RCBO Technical Specification:**

- **Standard(s):** EN/IEC 61009
- **Rating:** 6, 10, 16, 20, 32, 40, 63, 80, 100 & 125A
- **Breaking capacity:** 6000A
- **Rated Voltage:** 220/400V A.C. 50Hz
- **RCD Type:** Type AC
- **Rated Tripping Current:** 30mA
- **Terminal Capacity:** 2mm² - 16mm², 32-50A - 25mm², 63-100A - 30mm²
- **Terminal Torque:** 2NM
- **Endurance Operations:** Electrical 10,000, Mechanical 20,000
**Panel Board Name:** 01-DP  
**Panel Location:** Front of Multipurpose Building  
**Main Breaker:** 40A  
**Phase to Neut:** 220 VOLT  
**Single Phase, 3 Wire, 50Hz**  
**Surface Mounted**  

### Power Riser Diagram

```
+-------------------+-------------------+-------------------+
| Lighting (DP/01)  | Lighting (DP/02)  | Lighting (DP/03)  |
| 3(1cX1.5mm²)Ø20mm | 3(1cX1.5mm²)Ø20mm | 3(1cX1.5mm²)Ø20mm |
|                   |                   |                   |
| Socket (DP/05)    | Socket (DP/06)    | Socket (DP/07)    |
| 2.5mm²            | 2.5mm²            | 2.5mm²            |
|                   |                   |                   |
| Spare             |                   |                   |
|                   |                   |                   |
```

**Min. Busbar Rate:** 40A

### Power and Load Calculations

**Series Connected Load:** 3,640 VA

- **Lighting:**
  - (DP/01): 3(1cX1.5mm²)Ø20mm, P = 0.746kW
  - (DP/02): 3(1cX1.5mm²)Ø20mm, P = 0.756kW
  - (DP/04): 3(1cX1.5mm²)Ø20mm, P = 0.720kW

- **Socket:**
  - (DP/05): 3(1cX2.5mm²)Ø20mm, P = 0.900kW
  - (DP/06): 3(1cX2.5mm²)Ø20mm, P = 0.900kW

- **SPARE:** 3(1cX1.5mm²)Ø20mm, P = 0.720kW

### Standard Breaker Size

- 32A NSM-DP

**3(1cX16mm²) Cu P.V.C/PVC+16mm² Cu GND**

**10mm² Bare Copper Conductor**

**810mm PVC Conduit**

**Power Factor:** 0.7

**Demand Load (kVA):** 3.8 kVA

**Total Ampere:** 17.4000 A

**New Smart Classrooms**

50 Computers / Smart Classroom - DP Single Line Diagram
Panel Board Name: 02-DP  
Panel Location: Front of Multipurpose Building  
Main Breaker: 40A

**Wire & Conduit & Descriptions**

<table>
<thead>
<tr>
<th>Circuit</th>
<th>Wire &amp; Conduit</th>
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<td>CT NO</td>
<td>A</td>
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<tr>
<td>2905</td>
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</table>

**Sub-Total In (VA):** 3690

**Total Connected Load:** 5470 VA

**Demand Factor:** 0.7

**Demand Load (kVA):** 3.8 kVA

**Total Amperes:** 17,400 A

**Standard Breaker Size:** 32 A

**Power Riser Diagram:**
- 3(1cX1.5mm²) Cu P.V.C/PVC + 10mm² Cu GND
- 10mm² Bare Copper Conductor
- Ø100mm PVC Conduit

**NOTE:**
1. For Branch Circuit and Feeder Size Calculation, please refer to Voltage Drop Calculation on Design Analysis.

**RCBO Technical Specification:**
- Standard(s): EN/IEC 61009
- Rating: 6, 10, 16, 20, 32, 40, 63, 80, 100 & 125A
- Rated Voltage: 220/400V A.C. 50Hz
- Trip Type: Type AC
- Rated Breaking Capacity: 6000A
- Rated Voltage: 220/400V A.C. 50Hz
- RCD 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 + N1 module
- Trip: Thermal/Magnetic release
- IP Rating: IP20
- Terminal Capacity: 35mm DIN rail
- Size: 17.5mm Width
- Endurance Operations: Electrical 10,000, Mechanical 20,000
### Panel Board Specification

**Panel Board Name:** 03-DP  
**Panel Location:** Front of Multipurpose Building  
**Main Breaker:** 40A  
**Min. Busbar Rate:** 40A  
**Surface Mounted**

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<th>Circuit Load</th>
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#### Wire, Conduit & Descriptions

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#### Power Riser Diagram

- **NSM-DP**
- **Min. Busbar Rate:** 32A
- **1P 32A**
- **30mA**
- **1P 16A**
- **2(1cX16mm²) Cu P.V.C/PVC+16mm² Cu GND**
- **10mm² Bare Copper Conductor**
- **Ø100mm PVC Conduit**
- **3(1cX16mm²) Cu P.V.C/PVC+10mm² Cu GND**

### Notes

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:**

- **Standard(s):** EN/IEC 61009
- **Rating:** 6, 10, 16, 20, 32, 40, 63, 80, 100 & 125A
- **Breaking capacity:** 6000A
- **Rated Voltage:** 220/400V A.C. 50Hz
- **RCO Type:** Type AC
- **Rated Trip Current:** 30mA
- **Residual Current off time:** <0.1S
- **Operating Characteristics:** Type B, Magnetic Operating 3 to 5 times (Current Rating) Trip
- **IP Rating:** IP20
- **Terminal Capacity:** 6.30A - 16mm², 22-50A - 25mm²
- **Terminal Torque:** 2NM
- **IP Rating:** IP20
- **Endurance Operations:** Electrical 10,000, Mechanical 20,000