



**AFCAP/ETH/075**

**Training Programme for Improved Performance of Surface Treatments in Ethiopia**

## **ACCREDITATION REPORT**

**Ethiopian Roads Authority**

*September 2012*

This project was funded by the Africa Community Access Programme (AFCAP) which promotes safe and sustainable access to markets, healthcare, education, employment and social and political networks for rural communities in Africa.

Launched in June 2008 and managed by Crown Agents, the five year-long, UK government (DFID) funded project, supports research and knowledge sharing between participating countries to enhance the uptake of low cost, proven solutions for rural access that maximise the use of local resources.

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This material has been funded by UKaid from the Department for International Development, however the views expressed do not necessarily reflect the department's or the managing agent's official policies.

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## **1 EXECUTIVE SUMMARY**

The use of thin bituminous surfacings on paved roads is declining in Ethiopia in favour of asphalt concrete. This is due to lack of confidence in the road construction industry in the use of thin surfacings, and problems with specifications and quality control. Asphalt concrete is an unnecessarily expensive surfacing for lower traffic roads, where a thin bituminous surfacing is sufficient to resist traffic abrasion and protect the road pavement.

In order to solve this problem, a series of one-week training courses were implemented with the intention of reviving skills in the design, construction and maintenance of thin bituminous surfacings. Three groups of practitioners were involved in the training courses: operators and foremen, technicians and engineers. The training was carried out at the Ethiopian Road Authority's Alemgena Training and Testing Centre (ATTC) near Addis Ababa.

Technical education beyond high school level in Ethiopia is provided through the Technical and Vocational Education and Training (TVET) system. This system provides practical training for operators, foremen and technicians in various fields. Education and training for engineers is provided by Addis Ababa University.

There are various training centres across Ethiopia that offer professional training for the roads sector, the most significant of which is the ATTC. This is the only large scale public training centre in Ethiopia providing courses in mechanized road construction.

There is considerable scope for the training courses in thin bituminous surfacings to be integrated into the existing training systems in Ethiopia. The intention is that the courses implemented under AFCAP in February 2012 will be adopted by the ATTC as part of their standard curriculum and approved under the TVET system. This will require 'training of trainers' support to prepare the staff at the centre for carrying out the courses independently, and the inclusion of the thin bituminous surfacing training as a component of a larger ATTC course.

## 2 INTRODUCTION

### 2.1 Background

The use of thin bituminous surfacings for rural roads in Ethiopia has declined in recent years in favour of asphalt concrete (AC). This is due to a lack of industry confidence in thin bituminous surfacings caused by issues with bidding, project specifications and quality control. AC surfacing has thus been specified on roads where a cheaper thin bituminous surfacing would have provided an adequate and sufficiently durable seal. Therefore a training programme has been developed and implemented with the aim of restoring industry confidence in thin bituminous surfacings and to develop the skills in Ethiopia. The objective of the project was also to provide the Ethiopian Roads Authority (ERA) with the means to develop and deliver similar training courses in the future.

This training project has been implemented as part of AFCAP<sup>1</sup> activities in Ethiopia. AFCAP, which is funded mainly by the Department for International Development (UK) is a programme of research and knowledge dissemination for the rural transport sector in Africa. ERA decided to undertake the training project in surface treatments as part of their AFCAP activities. The need for training was highlighted in a 2009 AFCAP review of surface treatment practice in Ethiopia. The project activities have included:

- Production of training course materials such as presentations, handouts, notes, practical examples and worksheets.
- Production of a Best Practice Manual that gives guidance on the design, construction and maintenance of surface treatments, including a briefing note to inform decision takers of the advantages of thin bituminous surfacings.
- Conducting the training courses at the Alemgena Training and Testing Centre (ATTC) near Addis Ababa, and production of a training report.
- Production of a Final Project Report, summarising the outcomes of the project and including any relevant comments on the ERA Standard Technical Specification 2002, Series 6000.

The project comprised a modular training course based on improving the performance of thin bituminous surfacings in Ethiopia, carried out at the ATTC<sup>2,3,4</sup>. The training programme comprised various modules in the design, construction and maintenance of thin bituminous surfacings. It was aimed at improving the skills of operators and foremen, technicians and engineers in the Ethiopian road industry, in order to revive confidence in the practice and improve skills. The training course was conducted by Roughton International (RI) of UK. Those who fully attended the course received a certificate of attendance signed by the Director General of ERA.

### 2.2 Scope of this Report

The purpose of this report is to:

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<sup>1</sup> Africa Community Access Programme.

<sup>2</sup> Roughton International, *Training Programme for Improved Performance of Surface Treatments in Ethiopia, Inception Report, 2011*

<sup>3</sup> Roughton International, *Training Programme for Improved Performance of Surface Treatments in Ethiopia, Training Reports, 2012*

<sup>4</sup> Roughton International, *Training Programme for Improved Performance of Surface Treatments in Ethiopia, Final Project Report, 2012*

- Discuss the training facilities provided in Ethiopia, in particular the ATTC and its suitability for delivering courses in thin bituminous surfacings.
- Discuss the general educational syllabuses in Ethiopia in which the courses in thin bituminous surfacings could be included.
- Describe the training methods used during the implementation of the training courses in February 2012, and the interaction with training participants as well as the ATTC staff.
- Discuss the potential of future training programmes in thin bituminous surfacings and how they can be integrated into existing accredited training programmes in Ethiopia.

### **3 EXISTING TRAINING FACILITIES AND COURSES**

#### **3.1 Knowledge Gap**

During discussion with personnel at the ATTC, Ato Yetimgeta Asrat of ERA and Ato Haile Michael of TVET, it was learnt that there are currently no courses in the design of thin bituminous surfacings in Ethiopia. There is also no official training course specifically in the use of bitumen distributors and chip spreaders to construct thin bituminous surfacings.

#### **3.2 ERA Training Centres**

There are two training centres operated by ERA in Ethiopia:

- Alemgena Training and Testing Centre (ATTC). The Centre provides courses in mechanized road construction and is located 18 km from Addis Ababa.
- Chancho Training Centre. The Centre provides training in labour based methods of road construction and is located approximately 30 km from Addis Ababa.

The ATTC is the only large scale public training centre in Ethiopia in mechanized road construction. There are also small, private training centres running courses mostly for operators in the use of machinery such as graders, trucks and other equipment; however these are of limited capacity.

#### **3.3 Alemgena Training and Testing Centre**

The ATTC is discussed in this report as this is the training centre that hosted the training course implemented under this project. However, the lessons learnt at ATTC apply to all training centres, including the two ERA training centres, TVET training schools and private centres.

The ATTC was established in 1956 in order to upgrade the skill level of those engaged in the construction and maintenance of roads. The chief objective of the Centre is to improve the job performance of workers by extending knowledge and modifying attitudes, so that they can work as effectively as possible.

##### **3.3.1 Facilities**

A lecture theatre provided at the ATTC for the surface treatment training has a capacity of around 100 participants, and is equipped with audio and visual equipment. There are also numerous other smaller classrooms at the centre, each with a capacity of around 40.

The laboratories at the ATTC are in good condition and are well equipped for carrying out various tests with bitumen and aggregates. The bitumen laboratory is equipped to carry out the 'ring and ball' softening point test, the bitumen ductility test, the penetration test, bitumen viscosity and the bitumen flashpoint test, as well as other types of testing. The aggregate testing laboratory is equipped with a Los Angeles Abrasion machine, equipment for sieving and grading, flakiness index, Aggregate Impact Value (AIV) and Aggregate Crushing Value (ACV), amongst other tests.

The accommodation available at the ATTC for trainees is generally satisfactory, although with a capacity of 200 there is not always sufficient space. The catering provided at the Alemgena Centre is of good quality, with lunch provided daily, as well as morning and afternoon refreshments.

The ATTC has a library with capacity to serve 30 trainees at one time, with a book lending service in operation.

### 3.3.2 Staff

The ATTC is well staffed with trainers, engineers, laboratory technicians, management, administrative assistants and other support staff.

### 3.3.3 Courses

Civil Engineering courses currently running at ATTC include:

1. Road Material Quality Control.
2. Gravel Road Construction & Maintenance.
3. Road Pavement Construction & Maintenance.
4. Road Structures construction & Maintenance.
5. Surveying.
6. General Drafting.
7. Masonry.
8. Carpentry.

Equipment Operation courses currently running at ATTC include:

1. Road Construction Finishing Equipment Operation.
2. Road Construction Compacting Equipment Operation.
3. Road Construction Earth Moving Equipment Operation.
4. Road Construction Lifting Equipment Operation.
5. Road Construction Production Equipment Operation.
6. Road Construction Transporting Equipment Operation.

There are also courses in Trades and Crafts including:

1. Mechanics.
2. Electricity.
3. Welding.
4. Machine Technology.
5. Service Rendering.

Administration and Finance courses include:

1. Introduction to Management.
2. Introduction to Accounting.
3. Office and Records Management.
4. Labour Law.
5. Materials Management.

In addition to the above, there are four types of training programme carried out as follows:

1. Promotional Training, for the purpose of promoting employees.
2. Refresher Training, for upgrading the skill and performance of employees.
3. Familiarisation, usually intended for newly recruited engineers and other employees to introduce to them the activities of ERA, new technologies and their own specific assignments.
4. Orientation, this is a relatively short term programme concerning the general working environment, policies, rules, procedures and systems.

These courses are graded at TVET levels I, II, III and IV. See Section 5.3 for detail on TVET course accreditation.



### 3.4 Technical and Vocational Education and Training

The Technical and Vocational Education and Training (TVET) system in Ethiopia concerns education at grades 10, 10+1, 10+2 and 10+3 for pupils who attend technical schools. Some TVET units are part of the government Ministry of Education whereas some are privately owned. The TVET system concerns education and training for operators, foremen and technicians. The training and education programmes provided by TVET contain approximately 70% practical and 30% theoretical content. TVET schools that carry out training and education in road construction include:

- Addis Ababa Technical School
- Kefitegna District 20 Secondary School, Addis Ababa
- Nefas Silk Comprehensive Secondary School, Addis Ababa
- Entoto Technical School, Addis Ababa
- Misrak Comprehensive Secondary School, Addis Ababa
- General Wingate Construction School, Addis Ababa
- Kefitegna District 7 Comprehensive Secondary School, Addis Ababa
- Akaki Comprehensive Secondary School, Addis Ababa
- Jijiga Technical Vocational Training Centre
- Bahir Dar SDC, Amhara Region
- Wzo. Sehin Technical School, Dessie, Amhara Region

A full list of government schools carrying out construction courses in drafting, surveying, wood working, road construction and building construction is shown in

Appendix A.

### 3.5 Addis Ababa University

Thin bituminous surfacings are covered only very briefly in the Civil Engineering degree course at Addis Ababa University. Students may take the Highway Engineering I module, which is one semester in duration and covers geometrical highway design. The Highway Engineering II module may then be taken for one semester. It covers pavement design and materials, including one session on thin bituminous surfacings and one session on asphalt concrete. The two Highway Engineering modules are arranged as follows:

#### 3.5.1 Highway Engineering I

The following topics are included in this module:

1. Transport Systems.
2. Transport Planning
3. Traffic Operations: Driver, Pedestrian and Vehicles
4. Highway Route Surveys and Location
5. Geometric Design of Highways
6. Intersections, Interchanges and Terminals
7. Earthwork and Quantities

#### 3.5.2 Highway Engineering II

The following topics are included in this module:

1. Introduction
2. Stresses in Pavements
3. Traffic Loading
4. Subgrade Soils
5. Unbound Pavement Materials
6. Stabilized Pavement Materials
7. Bituminous Binders and Properties
8. Bituminous Mixtures
9. Structural Design of Pavements
10. Highway Drainage
11. Highway Maintenance and Rehabilitation

## **4 IMPLEMENTATION OF THE TRAINING COURSES**

The training courses were carried out at the ATTC by ERA and Roughton International (RI) in November 2011 and February 2012.

### **4.1 ATTC Staff**

The training programme was implemented in collaboration with ATTC staff, who were responsible for arranging classroom and laboratory facilities, materials such as pens and pencils for participants, participant accommodation and catering. The ATTC staff checked their attendance lists against the lists kept by the RI team. Laboratory technicians from the Centre delivered demonstrations of laboratory test procedures during the Technicians course.

Three trainers, a graduate engineer and a surveyor from ATTC participated in the Engineers week as part of their preparations for conducting the courses independently in the future. Additional copies of the training materials were made available to the ATTC staff.

The practical demonstrations carried out during the training programme in February 2012 were implemented in conjunction with the Ethiopian Roads Construction Corporation (ERCC) unit, whose premises are located adjacent to the ATTC.

### **4.2 Classroom Training**

The classroom training consisted of presentations, videos, discussion and explanation of the important aspects of design, construction and maintenance. Worksheets were completed by participants in order to reinforce their learning and to assess the level of understanding achieved.

### **4.3 Practical Training**

Practical demonstration of the construction of a double surface dressing was included in the training courses. Whilst carrying out the practical demonstrations, problems were experienced with the bitumen distributors. The first distributor, seen during the Familiarisation Visit in July 2011 and in Figure 1, was not in working order when the training courses were implemented in February 2012. A second, old distributor, shown in Figure 2, was also non functional. The rev counter, speedometer and slow speed speedometer on this distributor were all not functioning and the temperature gauge was unreliable. Therefore it was not possible to reliably control the bitumen application rate. In addition, an accident on site with this distributor then rendered it out of use. It was necessary to use a third machine, from the ERA emergency unit (shown in Figure 3) for the site training.

The bitumen distributor used in February 2012 had not been used prior to the training project and operators from the contractor and from ATTC were in the process of training to use it. During the implementation of the training, the principles of operating and maintaining the distributor were demonstrated to both ATTC operators and operators from the Ethiopian Roads Construction Corporation (ERCC), whose premises are adjacent to the ATTC.

The ATTC is equipped with a good quality self-propelled chip spreader, manufactured by Phoenix Engineering in the UK. Additional equipment at the centre includes water bowsers, front end loaders, trucks, pneumatic tyred rollers (PTRs) and air compressors, which were in good working order. Much of the available equipment has been donated to the centre by the Japan International Co-operation Agency (JICA).

**Figure 1** Bitumen distributor seen in July 2011



**Figure 2** Second Bitumen distributor now in disrepair



**Figure 3 Bitumen distributor used in February 2012**



**Figure 4 Self propelled chip spreader used in February 2012**



#### **4.4 Training Participants**

##### **4.4.1 Operators and Foremen**

Many of the participants in the training course in February 2012 stated that they would prefer a longer training course. Classroom training was felt to be better suited to engineers and technicians than to operators and foremen, who stated that they would prefer a higher proportion of practical work.

An equipment trainer from ERA was present amongst the participants in the Operators and Foremen course. A supervising foreman from the private sector, who is responsible for training within his company, was also among the participants and took an active role in providing advice and answering questions related to his experience during group discussions. Much of this discussion was carried out in the Amharic language. Many other participants in the group actively took part in the group discussions.

#### 4.4.2 Technicians

The participants attending the Technicians' course in February 2012 had a wider range of experience than the Operators and Foremen. Whereas the Operators and Foremen tended to have experience mainly on site, the technicians possessed a mixture of site, laboratory and design experience.

Several of the training participants were highly experienced technicians who were able to assist with aspects of the laboratory demonstrations. Many had points of discussion to raise during these demonstrations.

As with the Operators and Foremen course the previous week, many participants stated that they would like a longer course containing a higher level of practical work.

#### 4.4.3 Engineers

The participants attending during the Engineers week had a range of experience at different levels. There was also a mix of design engineers and site engineers.

Many participants stated through the evaluation questionnaires that they would like additional training in areas such as asphalt concrete construction, gravel road surfacing and earthworks, in addition to thin bituminous surfacings.



## 5 CONCLUSIONS

### 5.1 Numbers of Participants

The optimum number of training participants during classroom training is considered to be approximately 40 so that adequate attention can be given to all participants. There are also logistical issues for the centre in terms of accommodation if the number of participants is high. The optimum number of training participants in the practical demonstration and laboratory training is considered to be a maximum of 20, unless additional equipment can be provided. If there are more participants than this, the training participants cannot all actively take part in the work.

### 5.2 On Site Demonstrations

The practical demonstrations are useful for all participant groups within the training courses, in order to put the theory into context and to demonstrate the application of construction procedures. However, the practical demonstrations can only be effective for a limited number of participants. The demonstrations are also heavily dependant on the success of any base preparations required on the demonstration site. This proved to be problematic given the tight time constraints of the training programmes. A solution would be to carry out the practical demonstrations on a road that requires a reseal in order to reduce the rate of future deterioration, but does not have any existing structural problems in the pavement layers that must be repaired before a seal can be applied. It is also advisable that the demonstration site is located close to the training centre.

The problems with the older bitumen distributors were caused mainly by lack of maintenance, which can be solved by providing the operators at ATTC and the adjacent ERCC with further training to increase their awareness of good practice in equipment maintenance. It must be ensured that the operators using the distributor are aware of the need to:

- Circulate bitumen whilst in the tank.
- Use proper heaters for heating bitumen, rather than relying purely on the burners in the distributor.
- Not leave bitumen in the tank so that it cools to ambient temperature.
- Thoroughly clean all parts of the distributor inside and out at the end of each day's work.
- Calibrate the distributor regularly and be aware of the actual spray rate being delivered.

### 5.3 Accreditation of the Courses

The intention of ERA is that the training courses in thin bituminous surfacings will be adopted by the ATTC, and subsequently accredited under the TVET system.

All training courses at the centre are reviewed and accredited by TVET and ATTC can pursue accreditation of the thin bituminous surfacings courses according to normal procedure. The system of accreditation operated by TVET is based on quality indicators, defined by:

- Physical assets, such as the number and size of classrooms, workshops and materials.
- Human resources, such as the number and qualification of teachers<sup>5</sup>.

There are also new quality indicators that focus on internal quality management processes within institutions, such as capacities for labour market analysis, curriculum development, personnel

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<sup>5</sup> Ministry of Education, *National Technical and Vocational Education and Training (TVET), Strategy, 2008.*

management, human resource development strategies and financial management. Accreditation can be awarded to both public and private institutions at different levels and allows institutions to assess their capabilities and limitations, to develop targets for improvement and to access the development support provided within the TVET system.

TVET approve and accredit courses carried out at ATTC by checking quality indicators, whilst the recruitment of staff, production of training materials, examinations and course content at the ATTC is the responsibility of ERA and the ATTC itself.

For the courses on thin bituminous surfacings to be accredited they will need to be incorporated into a course with a minimum of three months duration, which will likely incorporate other areas of road construction and maintenance. In order to gain TVET accreditation for the thin bituminous surfacings course, the ATTC will require:

- Full handover of the training courses to the ATTC.
- Training of the ATTC trainers in order to enable them to deliver the courses.
- Course modules with student handouts, including detailed notes.
- Reference books and audio-visual aids.

A meeting should be arranged in which representatives of TVET, ERA Training Unit and the ATTC will discuss the detailed methodology for the adoption and accreditation of these courses.



## **6 RECOMMENDATIONS FOR FUTURE SKILL DEVELOPMENT**

This section gives recommendations for the development and retention of skills in the design, construction and maintenance of thin bituminous surfacings.

### **6.1 Implementation of Future Courses**

#### **6.1.1 Operators and Foremen**

It is recommended that future courses for Operators and Foremen are more practical based, with a smaller component of theoretical classroom training. Operators in particular should be given the opportunity to use equipment first hand, in order to reinforce their understanding of good practice. It would be ideal to run a longer Operators and Foremen course across two weeks, with three days of classroom training followed by seven days of practical training with the equipment. It is only possible for participants to use equipment first hand if the number of participants is small, or if additional equipment can be provided.

#### **6.1.2 Technicians**

Technicians' courses in the future should be longer duration and more laboratory based, with opportunities for the training participants to carry out the tests themselves. This is based on observation during the course implemented in February 2012, as well as participant comments on evaluation forms. Due to the variation in experience of the Technicians participants in February 2012, a future course should ideally incorporate a balance of classroom, laboratory and practical training. Classroom training is more useful for Technicians than for Operators and Foremen.

#### **6.1.3 Engineers**

It is recommended that the Engineers also are provided with a course longer than one week. This is based on observation as well as feedback from the participants. It would be beneficial for the engineers to spend a week carrying out theoretical training in the classroom, with lectures, worksheets, design examples and videos. Engineers should then receive a week of practical training with the equipment so that they are better placed to supervise operators, foremen and other personnel on site. Engineers should also be given laboratory training to improve their awareness of quality control procedures.

#### **6.1.4 Safety**

It is recommended that specialist safety training is integrated into the programmes at the ATTC. This would contain detailed instruction and demonstration regarding site safety, including traffic control, site barriers and road signs. This would also include instruction on personal safety, including the correct use of (Personal Protective Equipment) PPE, working safely with bitumen and the treatment of bitumen burns. There is a medical clinic at the ATTC with staff who can assist with first aid demonstrations.

### **6.2 Future Trainers**

It is envisaged that trainers from the ATTC will conduct the training programmes independently in the future. Whilst carrying out the training courses in February 2012, a small number of trainers from the ATTC participated in the classroom training and the practical demonstrations. The laboratory staff at the ATTC were also directly involved in the training and conducted laboratory sessions. However, further work will be required before the ATTC trainers are in a position to deliver the courses independently. A 'train the trainers' course should be carried out that will enable the ATTC trainers to deliver the training in future programmes. This course should focus

on the important aspects of design, construction and quality control, as well as providing an opportunity to resolve any areas of uncertainty and to answer any questions. The successful adoption of the courses by the ATTC will enable the retention of skills in thin bituminous surfacing in the construction industry in Ethiopia.

It is important that sufficient personnel are assigned to fill the roles of the trainers once the training courses are adopted by the ATTC. For a group of 40 training participants the training staff should include three or four expert trainers, along with one or two support staff. The expert trainers ideally should meet the following requirements:

- More than 10 years experience in the construction of sealed roads.
- Experience working in Ethiopia and knowledge of the local industry.
- Experience in the design of thin bituminous surfacings as well as experience on site.
- Fluent in both English and Amharic.

### **6.3 Training Centre**

The facilities provided at the ATTC are well suited for delivering the courses and this centre should be used in future courses.

**Appendix A List of TVET Schools Providing Courses in Construction**

Serial No.	School (Centre)	Region	Zone	Wereda	Town	Drafting	Surveying	Wood working	Road Construction	Building construction
1	Addis Ababa Technical School	Addis Ababa	1	3	Addis Ababa	x	x	x	x	x
2	Kefitegna 4 Secondary School	Addis Ababa	1	4	Addis Ababa	x		x		
3	Kefitegna 20 Secondary School	Addis Ababa	2	20	Addis Ababa	x	x	x	x	x
4	Nefas Silk Comprehensive Secondary School	Addis Ababa	3	19	Addis Ababa	x	x	x	x	x
5	Entoto Technical Vocational School	Addis Ababa	4	11	Addis Ababa	x	x	x	x	x
6	Kefitegna 12 Comprehensive Secondary School	Addis Ababa	4	12	Addis Ababa	x		x		x
7	Misrak Comprehensive Secondary School	Addis Ababa	4	16	Addis Ababa	x	x	x	x	x
8	General Wingate Construction school	Addis Ababa	5	25	Addis Ababa	x	x	x	x	x
9	Kefitegna 7 Comprehensive Secondary School	Addis Ababa	5	7	Addis Ababa	x	x	x	x	x
10	Akaki Comprehensive Secondary School	Addis Ababa	6	26	Akaki	x	x	x	x	x
25	Merti Comprehensive Secondary School	Oromiya	East Shoa	Fentale	Merti	x		x		
26	Wonji Comprehensive Secondary School	Oromiya	East Shoa	Adama	Wonji	x		x		
33	Adama Technical School	Oromiya	East Shoa	Adama	Adama			x		
34	Dabena Technical school	Oromiya	Ilubabor	Buno Bedelie	Dabena			x		x
36	Assela SDC	Oromiya	Arsi	Tiyo	Asella	x	x	x		x
37	Ambo SDC	Oromiya	West Shoa	Ambo	Ambo	x	x	x		x
38	Gimbi SDC	Oromiya	West Wolega	Gimbi	Gimbi	x	x	x		x
39	Jimma SDC	Oromiya	Jimma	Goma	Jimma	x	x	x		x
40	Metu SDC	Oromiya	Ilubabor	Mettu	Mettu	x	x	x		x
41	Robe SDC	Oromiya	Bale	Sinana	Robe	x	x	x		x
42	Nekemtie SDC	Oromiya	East Wolega	Guto Wari	Nekemtie	x	x	x		x
43	Zway Technical Training Centre	Oromiya	East Shoa	Adamie Tulu	Zway					x

Serial No.	School (Centre)	Region	Zone	Wereda	Town	Drafting	Surveying	Wood working	Road Construction	Building construction
47	Jijiga Technical Vocational Training Centre	Somali	Jijiga	Jijiga	Jijiga		x	x	x	x
48	Jijiga Technical Vocational Training	Somali	Jijiga	Jijiga	Jijiga	x	x	x	x	x
49	Asosa Senior Secondary School	Benishangul-Gumuz	Asosa	Asosa	Asosa			x		
50	Manbuk Senior Secondary School	Benishangul-Gumuz	Metekel	Metekel	Manbuk			x		
51	Bahir Dar SDC	Amhara	Bahir Dar	Bahir Dar	Bahir Dar	x	x	x	x	x
52	Injibara Senior Secondary School	Amhara	Awi	Injibara	Injibara			x		x
54	Debre Markos SDC	Amhara	East Gojam	Debre Markos	Debre Markos	x	x	x		x
56	Debre Birhan SDC	Amhara	North Shoa	Debre Birhan	Debre Birhan	x	x	x		x
57	Ataye Senior Secondary School	Amhara	North Shoa	Tarma Ber	Debre Sina			x		x
58	Wzo. Sehin Technical school	Amhara	South Wollo	Dessie	Dessie			x	x	
59	Dessie SDC	Amhara	South Wollo	Dessie	Dessie	x	x	x		x
61	Aqesta Senior Secondary School	Amhara	South Wollo	Legambo	Aqesta			x		x
62	Woldya SDC	Amhara	North Wollo	Woldya	Woldya	x	x	x		x
63	Mehal Meda	Amhara	North Shoa	Gerakeya	Mehal Meda			x		x
64	Lalibela Senior Secondary School	Amhara	North Wollo	Bugna	Lalibela					x
65	Debre Tabor SDC	Amhara	South Gondar	Debre Tabor	Debre Tabor	x	x	x		x
66	Nefas Mewcha Senior Secondary School	Amhara	South Gondar	Lai Gaint	Nefas Mewcha			x		
67	Addis Zemen Senior Secondary School	Amhara	South Gondar	Kemekem	Addis zemen					x
68	Gondar SDC	Amhara	North Gondar	Gondar	Gondar	x	x	x		x
69	Debark Comprehensive Secondary School	Amhara	North Gondar	Debark	Debark			x		x
70	Quolladeba Comprehensive Secondary School	Amhara	North Gondar	Dembia	Golla Deba			x		

Serial No.	School (Centre)	Region	Zone	Wereda	Town	Drafting	Surveying	Wood working	Road Construction	Building construction
71	Medhanialem Comprehensive Secondary School	Harar	Harar	Harar	Harar	x	x	x		x
73	Dire Dawa Technical School	Dire Dawa	Dire Dawa	Dire Dawa	Dire Dawa	x		x		x
74	Adadale Technical & Vocational School	Afar	1	Aysaita	Aysaita					x
75	Luci Senior Secondary School	Afar	3	Ami Bara	Melkawerer					x
83	Mekele SDC	Tigray	Mekele	Debubawi	Mekele	x	x	x		x
84	Axum SDC	Tigray	Makelawi		Axum	x	x	x		x
85	Adigrat SDC	Tigray	Misrakawi	Ganta Afeshem	Adigrat	x	x	x		x
86	Korem SDC	Tigray	Debubawi	Ofla	Korem	x	x	x		x
94	Boditi Senior Secondary School	SNNPR	Wolayta	Darnot gale	Boditi			x		
97	Arba Minch Comprehensive Secondary School	SNNPR	Gamogofa	Arbaminch Zuria	Arbaminch			x		
105	Goro Comprehensive Secondary School	SNNPR	Gurage	Goro	Wolkite			x		
107	Alaba Comprehensive Secondary School	SNNPR	Kembata, Tembaro	Alaba	Alaba			x		
113	Yirgalem Comprehensive Secondary School	SNNPR	Sidama	Dalle		x	x			
115	Aleta Wendo Senior Secondary School	SNNPR	Sidama	Wondo	Aleta Wendo			x		
117	Hawassa Technical School	SNNPR	Sidama	Hawassa Zuria	Hawassa	x	x	x		
118	Hawassa SDC	SNNPR	Sidama	Hawassa Zuria	Hawassa	x	x	x		x
119	Dilla SDC	SNNPR	Gedeo	Wonago	Dilla	x	x	x		x
120	Arba Minch SDC	SNNPR	Gamogofa	Arbaminch Zuria	Arba Minch	x	x	x		x
121	Bonga SDC	SNNPR	Kaffa	Gimbo	Bonga	x	x	x		x
122	Sodo SDC	SNNPR	Wolayta	Sodo Zuria		x	x	x		x
123	Hossana SDC	SNNPR	Hadya	Lemo		x	x	x		x
124	Butajira SDC	SNNPR	Gurage	Meskanina Mareko	Butajira	x	x	x		x
126	Openo Technical Vocational School	Gambella	Gambella	Gambella	Gambella			x		