



STAFFER
EUROPEAN RAIL SKILLS ALLIANCE



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Implementation of VET at EQF levels 3 to 5

DELIVERABLE D6.5



Co-funded by the
Erasmus+ Programme
of the European Union



Deliverable Status	
Deliverable Leader	Conservatoire national des arts et métiers (Cnam)
Internal Reviewer 1	HTL Rennweg
Internal Reviewer 2	HTL Modling
Type	Document
Work Package	WP6.5
ID	D6.5 - Implementation of VET at EQF levels 3 to 5
Due Date	September 23 rd , 2024
Delivery Date	August 27 th , 2024
Status	
Dissemination Level	Public

Document History	
Contributions	CNAM
Track Change	V0.1





TABLE OF CONTENTS

DISCLAIMER	7
LIST OF ABBREVIATIONS	8
1 INTRODUCTION	11
2 DEVELOPMENT OF MOBILITY AND TRAINING PROGRAMMES	13
2.1 OVERVIEW	13
2.2 IDENTIFICATION OF TRENDS.....	14
2.3 OCCUPATIONAL PROFILES CLUSTERING	14
3 COMPREHENSIVE QUESTIONNAIRES FRAMEWORK AND EVALUATION	
MEHTODOLOGY	16
3.1 COMPREHENSIVE QUESTIONNAIRE FRAMEWORK FOR EVALUATING PILOT PROGRAMMES	16
3.1.1 STUDENTS QUESTIONNAIRE	16
3.1.2 TEACHER QUESTIONNAIRE.....	16
3.1.3 IN-COMPANY SUPERVISOR SURVEY	17
3.1.4 SURVEY FOR ORGANISER – SHORT TERM SURVEY	17
3.1.5 SURVEY FOR ORGANISER – LONG TERM SURVEY	17
3.2 EVALUATION FRAMEWORK AND METHODOLOGY.....	18
4 FOR.FER SRL.....	19
4.1 INTRODUCTION	19
4.2 BASICS OF RAILWAY TECHNICS	20
4.3 TRAIN PREPARER TRAINING PROGRAMME.....	20
4.3.1 OVERVIEW	20
4.3.2 TRAINING OBJECTIVES.....	20
4.3.3 SPECIALISED ROLES.....	21
4.3.4 ELIGIBILITY CRITERIA AND SELECTION PROCESS.....	21
4.4 TRAIN ATTENDANT PROGRAMME OVERVIEW	22
4.4.1 OVERVIEW	22
4.4.2 TRAINING OBJECTIVES.....	22
4.4.3 ELIGIBILITY CRITERIA AND SELECTION PROCESS.....	23
4.5 TRAIN DRIVER – STAFFER PILOT PROGRAMME.....	23
4.5.1 DESCRIPTION OF THE TRAIN DRIVING PROGRAMME	23
4.5.1.1 OVERVIEW	23
4.5.1.2 LEARNINGS’ OBJECTIVES.....	24





4.5.1.3	ELIGIBILITY CRITERIA AND SELECTION PROCESS	25
4.5.2	TRAIN DRIVER RESOURCES AND MATERIALS.....	25
4.5.3	TRAINING DELIVERY AND EVALUATION MECHANISMS	26
4.5.4	COMPLIANCE AND LEGAL REQUIREMENTS.....	26
4.5.5	SURVEY ANALYSIS REPORT FOR TRAIN DRIVER COURSES	26
4.5.5.1	PARTICIPANT SATISFACTION	27
4.5.5.2	LEARNING OUTCOMES	27
4.5.5.3	RELEVANCE AND APPLICABILITY.....	27
4.5.5.4	INSTRUCTOR/TRAINER EFFECTIVENESS	28
4.5.5.5	PROGRAMME DESIGN AND STRUCTURE.....	28
4.5.5.6	ENGAGEMENT AND PARTICIPATION	28
4.5.5.7	IMPACT ON PERFORMANCE	28
4.5.5.8	FEEDBACK AND SUGGESTIONS FOR IMPROVEMENT.....	29
4.5.5.9	QUALITY VALUES	29
4.5.6	RECOMMENDATIONS.....	29
4.5.7	CONCLUSION	30
5	HIGHER TECHNICAL INSTITUTES MÖDLING AND RENNEWEG	31
5.1	OVERVIEW OF THE AUSTRIAN EDUCATION SYSTEM	31
5.2	HTL MÖDLING.....	32
5.3	HTL RENNWEG.....	32
5.4	RAIL SPECIFIC DRIVE SYSTEMS PILOT PROGRAMME.....	33
5.4.1	DRIVE SYSTEM COURSE	33
5.4.2	MICROCREDENTIAL RAIL-SPECIFIC DRIVE SYSTEM COURSE	34
5.4.3	SURVEY ANALYSIS REPORT FOR RAIL SPECIFIC DRIVE SYSTEM MICROCREDENTIAL COURSE.....	35
5.4.3.1	PARTICIPANT SATISFACTION	36
5.4.3.2	LEARNING OUTCOMES	36
5.4.3.3	RELEVANCE AND APPLICABILITY.....	36
5.4.3.4	INSTRUCTOR/TRAINER EFFECTIVENESS	36
5.4.3.5	PROGRAM DESIGN AND STRUCTURE	36
5.4.3.6	ENGAGEMENT AND PARTICIPATION	37
5.4.3.7	IMPACT ON PERFORMANCE	37
5.4.3.8	COMPLETION AND CERTIFICATION.....	37
5.4.3.9	FEEDBACK AND SUGGESTIONS FOR IMPROVEMENT.....	37
5.4.3.10	QUALITY VALUES.....	37



5.4.4	CONCLUSION AND RECOMMENDATIONS	38
5.5	MANDATORY SUBJECT - RAIL SPECIFIC INTERNSHIP	39
5.5.1	OVERVIEW OF THE INTERNSHIP PROGRAM	39
5.5.2	EDUCATIONAL AND TEACHING OBJECTIVES	39
5.5.3	SUBJECT MATTER AND PRACTICAL APPLICATION	40
5.5.4	COMPANY PRACTICE AND SUPPORT	40
5.5.5	INTEGRATION AND SUPERVISION OF STUDENTS AT ÖBB	41
5.5.5.1	INTEGRATION PROCESS	41
5.5.5.2	REQUIRED DOCUMENTATION.....	42
5.5.5.3	EVALUATION.....	42
5.5.5.4	INTERNSHIP STATISTICS.....	42
5.5.5.5	SAFETY REGULATIONS FOR INTERNS.....	42
5.5.6	SURVEY ANALYSIS REPORT FOR MANDATORY SUBJECT: RAIL SPECIFIC INTERNSHIP	43
6	CONSERVATOIRE NATIONAL DES ARTS ET METIERS	44
6.1	INTRODUCTION	44
6.2	CONTINUOUS AND APPRENTICESHIP TRAINING PROGRAMMES	45
6.3	REGULATORY FRAMEWORK AND PROCEDURES FOR IMPLEMENTING TRAINING PROGRAMMES AT CNAM	46
6.4	DIAGNOSIS OF SKILLS AND TRAINING NEEDS IN THE RAILWAY TRANSPORT SECTOR	48
6.5	TRANSFORMEURS PROJECT	49
6.6	COVERED INITIATIVE.....	50
6.7	CNAM’S TRAINING PROGRAMMES	52
6.7.1	PROFESSIONAL SPECIALIZATION DIPLOMA (DSP).....	52
6.7.2	DIPLOMA OF UNIVERSITY STUDIES IN SCIENCE AND TECHNOLOGY (DEUST)	53
6.7.3	DSP IN “ELECTRIC BATTERY CONSTRUCTION AND MAINTENANCE OPERATOR”	53
6.7.4	DSP PUBLIC TRANSPORT DRIVER	54
6.7.5	DSP IN RAILWAY MAINTENANCE	55
6.7.6	DEUST IN MAINTENANCE OF ELECTRICAL SYSTEMS FOR URBAN TRANSPORT.....	55
6.8	TRAINING COURSE ON HIGH-SPEED TRAIN BRAKING SYSTEM.....	56
6.8.1	OVERVIEW	56
6.8.2	APPLIED PHYSICS FOR RAILWAY SYSTEMS.....	57
6.8.3	HIGH-SPEED TRAIN BRAKING SYSTEM: FUNDAMENTALS AND MAINTENANCE APPLICATIONS.....	57
7	CONCLUSION	58

TABLE OF FIGURES

FIGURE 1 - MARKETING FLYER PUBLISHED ON FOR.FER SRL OFFICIAL LINKEDIN ACCOUNT ON 30TH APRIL 2024.....	19
FIGURE 2 - TRAIN DRIVER PROGRAMME POST ON FOR.FER SRL WEBSITE.....	24
FIGURE 3 - STATIC TRAIN DRIVING SIMULATOR INSTALLED AT FOR.FER SRL.....	25





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LIST OF ABBREVIATIONS

AHS	Allgemeinbildende Höhere Schule
AMI – CMA	Appel à Manifestation d'Intérêts – Compétences et Métiers d'Avenir
ANSFISA	Agenzia Nazionale per la Sicurezza delle Ferrovie e delle Infrastrutture Stradali e Autostradali
AUTH	Aristotle University of Thessaloniki
BHS	Berufsbildende Höhere Schule
BMS	Berufsbildende Mittlere Schule
CNAM	Conservatoire National des Arts et Métiers
CoVE	Centres of Vocational Excellence
CoVERED	CoVE for Railway Empowerment and Development
CTI	Commission des Titres d'Ingénieur
CTU	Czech Technical University
DB	Deutsche Bahn
DEUST	Diplômes d'Etudes Universitaires Scientifiques et Techniques
DICEA	Department of Civil, Construction, and Environmental Engineering
DITS	Development & Innovation in Transport Systems
DNF	Direction National des Formations
DSP	Diplôme de Spécialisation Professionnelle
EC	European Commission
EPN	Equipe Pédagogique National





EQF	European Qualification Framework
EU	European Union
HCERES	Haut Conseil de l'évaluation de la recherche et de l'enseignement supérieur
HTL	Höhere Technische Lehranstalt
HTL3R	HTL Rennweg
IQES	Instrumente für die Qualitätsentwicklung und Evaluation in Schulen
ISP	Internet Service Providers
IT	Information Technology
ITS MOST	Istituto Tecnico Superiore per la Mobilità Sostenibile
MAFEX	Material Ferroviario de Exportación
NDA	Non-Disclosure Agreement
ÖBB	Österreichische Bundesbahnen
ÖBB TS	ÖBB Technische Services GmbH
PPE	Personal Protective Equipment
RNCP	Répertoire National des Certifications Professionnelles
RFI	Rete Ferroviaria Italiana
SESF	Systèmes Electroniques - Signalisation Ferroviaire
SME	Small and Medium Enterprise
SSIF SpA	Società Subalpina Imprese Ferroviarie
STAFFER	Skills Training Alliance for Future European Railway system
TUD	Technische Universität Dresden





UNIGE	University of Genoa
Uniroma1	Università degli Studi di Roma La Sapienza
UASFH	University of Applied Sciences Fachhochschule Erfurt
UTP	Union des Transports Publics et Ferroviaires
VET	Vocational Education and Training



1 INTRODUCTION

The STAFFER (Skills Training Alliance For the Future European Rail System) project aims to address the skills gaps in the European rail sector by developing and implementing innovative training and educational programmes across various European Qualifications Framework (EQF) levels. The primary focus of Task 6.5 is on implementing Vocational Education and Training (VET) programmes at EQF levels 3 to 5, targeting the lower to intermediate skill levels necessary for the sector's workforce. By doing so, Task 6.5 aims to enhance the sectoral skills of students, apprentices, and staff, thereby contributing to the overall goal of the STAFFER project: creating a well-trained and adaptable rail workforce capable of meeting the evolving demands of the industry.

The main objective of this deliverable is to provide a comprehensive account of the implementation of VET programmes at EQF levels 3 to 5 as part of Task 6.5. This includes a description of the new courses introduced, modifications made to existing ones, and specific work-based activities designed to enhance essential skills for the rail industry. The deliverable provides an overview of the implementation process, summarizing the adapted training programmes developed by the participating educational institutions. It also explores the pilot programmes, offering detailed descriptions of their design, execution, and evaluation.

The partner contributions section provides insights into the specific roles and outcomes achieved by each partner involved in Task 6.5. This part of the report underscores the collaborative efforts and diverse expertise each partner brought to the table, highlighting the collective impact on the project's success. An essential part of the deliverable is the evaluation segment, which assesses the effectiveness of the implemented programmes by evaluating participant satisfaction, learning outcomes, and overall programme impact. It provides a critical analysis of how well the programmes met their objectives and the benefits they brought to participants and the industry.

Finally, the deliverable outlines future directions, offering recommendations for sustaining and expanding the training programmes beyond the project lifecycle to ensure their long-term impact and relevance. It suggests ways to build on the successes achieved during the project and to adapt to future needs in the rail industry.

Task 6.5 involved extensive collaboration among various educational partners to develop and implement VET programmes tailored to the needs of the rail industry. The work began with a thorough analysis of the outputs from WP4, which identified the critical skills and knowledge gaps in the sector. Based on these findings, new courses were designed, and existing ones were adapted to incorporate the necessary rail-specific content and work-based learning activities.

The implementation phase included the development of common study materials, pilot testing of selected programmes, and continuous monitoring and evaluation to ensure the quality and effectiveness of the training provided.

Four partners were directly involved in implementing low-level EQF programmes:

- 1- **The railway-dedicated vocational training center “For.Fer Srl”.**
- 2- **The higher technical institutes “HTL Mödling” .**
- 3- **The higher technical institutes “HTL Rennweg”.**
- 4- **The higher education and research institution, the “Conservatoire national des arts et métiers” (Cnam), a specialist in continuous and initial apprenticeship training programmes.**

For.Fer Srl implemented four training programmes: train preparer, train attendant, train driver, and basics of railway techniques. The train driver-training programme was selected as the pilot programme for Task 6.5.

HTL Mödling and HTL Rennweg are not specifically rail-focused technical institutes. However, efforts were made to implement rail-specific drive systems and a mandatory subject-specific internship (in collaboration with ÖBB) as pilot programmes. Additionally, HTL Rennweg has implemented rail-related IT training.

The Conservatoire national des arts et métiers (Cnam), co-leader of WP6 and leader of Task 6.5, initially offers an EQF 7 engineering degree in Electronics Systems, specializing in Railway Signalling. Participation in the STAFFER project has prompted Cnam to broaden its perspective and engage in several national and European projects aimed at significantly transforming future training offerings. Notably, Cnam has participated in France's 2030 national project, *Transformeurs*, led by UTP (Union of Public and Rail Transports). As part of this initiative, Cnam will introduce several training programmes detailed in this report. Additionally, leveraging the collaboration of 13 active STAFFER partners, Cnam has submitted a proposal for an ERASMUS+ KEY ACTION 2 project under the Call for Centers of Vocational Excellence, titled *CoVERED* (Centre of Vocational Excellence for Railway Empowerment and Development), and specifically dedicated to EQF level 3-5 rail-specific training programmes.

With the endorsement of the Scientific Board of the "Equipe Pédagogique Nationale de l'Electronique, Energie Electrique, Automatique et Mesure" and the Training Council, Cnam has introduced:

- **A new EQF Level 4 Professional Specialisation Diploma (DSP) in Electric Battery Construction and Maintenance**, approved and registered in the National Directory

- of Professional Certifications (RNCP). This diploma is introduced in response to the growing significance of electromobility.
- **A new EQF level 5 Diploma of Scientific and Technical University Studies (DEUST) in “Electronics, Electrical Energy, and Control,”** featuring a specific focus on Maintenance of Energy Systems for Modern Transport. The programme was submitted in May 2024 to the National Directory of Professional Certifications.

Cnam has developed two rail-specific courses in both French and English: an EQF Level 3 course titled 'Applied Physics for Railway Systems' and an EQF Level 4 course titled 'High-Speed Train Braking Systems: Fundamentals and Maintenance Applications.' These courses will be incorporated into future training programmes that Cnam plans to develop and implement.

This deliverable report provides a detailed account of the activities, outcomes, and insights gained from Task 6.5 within the STAFFER project. To offer a comprehensive overview of the document's structure and content, we will conclude this introduction section with a brief description of the deliverable's decomposition. The second section on WP4 findings summarises the crucial insights derived from Work Package 4 of STAFFER project, which were instrumental in shaping the development of the training programmes within Task 6.5 and Task 6.6, the latter focusing on EQF levels 6-8. These findings served as a foundation by identifying specific educational needs and skill requirements within the rail sector. The subsequent section delves into the evaluation methodology, utilizing comprehensive questionnaires to assess the effectiveness of the pilot programmes. The following three sections (sections 4, 5 and 6) present detailed case studies of each partner organization involved, highlighting specific training programmes, their objectives, and outcomes. An analysis is then provided on the training initiatives by For.Fer Srl, HTL Mödling, HTL Rennweg, and Cnam, showcasing their contributions and pilot programme implementations. The deliverable also includes an evaluation of the pilot programmes, assessing participant satisfaction, learning outcomes, and offering recommendations for the future development and sustainability of these VET initiatives. This structured approach ensures a thorough exploration of the project's impact and lays the groundwork for continued advancement in rail sector training.

2 DEVELOPMENT OF MOBILITY AND TRAINING PROGRAMMES

2.1 Overview

Task 4.5 “Development of Mobility and Training Programmes“ of STAFFER project is an important foundation for future implementation activities in WP6 "Implementation of Training

and Mobility Programmes." Selected programmes, developed in this task, will be implemented in pilot cases in WP6.

The methodology for programmes development comprises four main phases:

- **Skills and EQF Levels Matching**
- **Occupational Profiles Clustering and Programme Selection**
- **Skills and Programme Matching**
- **Programme Finalization**

2.2 Identification of Trends

Fourteen trends were identified based on the outcomes of previous work packages (WP1, WP2, WP3):

1. **Big Data & Artificial Intelligence**
2. **Cybersecurity & Internet of Things (IoT)**
3. **Global New Energies & Technologies**
4. **Formal Methods for System Design & Verification**
5. **Living Language**
6. **Networking & ICT Technologies**
7. **Norms, Standards & Certification**
8. **Reliability, Maintenance & Life Cycle Management**
9. **Safety, Dependability, Security**
10. **Smart Cities & Smart Station Design**
11. **Transportation Systems**
12. **Transversal Skills: Learning, Communication, Soft Skills**
13. **Virtual Reality**
14. **Web Development**

2.3 Occupational Profiles Clustering

Occupational profiles were clustered based on required training and educational paths. Six main programmes were identified to address these profiles, as detailed below:

- **EQF Levels 3-5 Programmes** : These are directly linked to specific occupational profiles, such as :
 - **Train Driver Programme.**
 - **Rail Traffic/Operations Technicians Programme:** Covers all profiles related to traffic management and control.



- **Railway Systems Technicians Programme:** Encompasses profiles related to the design and maintenance of infrastructure and rolling stock.
- **EQF Levels 6-8 Programmes:** These introduce specific railway engineering profiles, moving beyond traditional engineering disciplines:
 - **Railway Systems Engineer:** Responsible for designing and planning physical rail systems.
 - **Rail Traffic/Operations Engineer:** Focuses on designing and planning train control and operations.
 - **Rail Transport Engineer:** Manages the entire rail transport system, integrating infrastructure, rolling stock, operations, and business aspects.

The **Train Drivers Programme**, categorised under EQF Level 3-5, is designed to train individuals in operating locomotives in compliance with stringent safety, operational, and communication regulations. Participants will acquire essential skills in train driving, control, and operations, emphasizing the importance of driving locomotives, ensuring safety, effective communication, train control, and logistics coordination.

The training programmes for **rail traffic/operations technicians** and **railway systems technicians** are designed to equip individuals with specialised skills essential for the safe and efficient functioning of the rail sector. The programme for **rail traffic/operations technicians** focuses on preparing individuals to manage and control the movement of trains, ensuring safe operations across all conditions, including normal, degraded, and emergency situations. These technicians acquire the critical skill of performing train control and operations, which involves tasks such as controlling traffic and train movements, checking signalling and safety systems, and coordinating logistical aspects.

On the other hand, the training programme for **railway systems technicians** aims to develop expertise in the construction, installation, inspection, testing, and maintenance of railway infrastructure and rolling stock. Participants in this programme gain the necessary skills to work on the physical systems of the railway, including the inspection and maintenance of infrastructure and rolling stock, as well as the building, testing, and installation of these critical components. Both programmes emphasise practical and technical knowledge, preparing individuals to handle the complex and technical challenges of the rail industry.

For more advanced training, the **Railway Systems Engineering Programme**, **Rail Traffic/Operations Engineering Programme**, and **Rail Transport Engineering Programme** are available at EQF Levels 6-8. These programmes delve deeper into specialised engineering fields, preparing participants for higher-level responsibilities within the railway sector.



STAFFER partners, vocational training center For.Fer srl, high technical institutes HTL Rennweg and HTL Mödling, and high education and research establishment Cnam will offer programmes categorised under EQF Level 3-5. For.Fer srl provides courses in the basics of railway techniques, train attendant training, train preparer, and train driver programmes. HTLs implement a micro-credential rail-specific drive systems course in electrical engineering and mandate specific internships to ensure practical experience. Additionally, HTL Rennweg have also rail-specific IT topics.

The next section will detail the design of the questionnaires used to survey the implemented pilot programs.

3 COMPREHENSIVE QUESTIONNAIRES FRAMEWORK AND EVALUATION METHODOLOGY

3.1 Comprehensive Questionnaire Framework for Evaluating Pilot Programmes

Questionnaires for the pilot training programmes should offer a comprehensive overview of each survey's objectives, the specific areas being evaluated, and the significance of participant feedback in improving the quality and relevance of the training programmes within the STAFFER project.

3.1.1 Students Questionnaire

The survey aims to gather valuable insights into the effectiveness and relevance of the pilot training programmes. Students are asked to evaluate their understanding of course content, clarity of objectives, adequacy of teaching methods and study materials, and the overall professional relevance of the course. Feedback is solicited on how the course contributes to their technical skills development and knowledge enhancement. Recommendations are sought regarding potential improvements and whether students would recommend the course to others. This feedback is crucial for refining and optimizing future training programmes to better meet the evolving needs of the railway sector.

3.1.2 Teacher Questionnaire

For educators involved in delivering pilot training programmes under the STAFFER project, their feedback is essential in ensuring the alignment of educational offerings with industry requirements. The survey assesses the integration of transversal and digital skills, preparation of students for future roles in the railway sector, and the effectiveness of using realistic

simulations and work-related activities. Teachers are asked to provide insights into the overall impact of the course on student performance and the level of support for student reflection and review. This information helps in identifying strengths and areas for improvement in curriculum design and teaching methodologies, thereby enhancing the quality and relevance of railway education.

3.1.3 In-Company Supervisor Survey

Supervisors who have hosted learners from the STAFFER project's training programmes are invited to share their insights and evaluations. The survey focuses on supervisors' satisfaction with the knowledge and skills acquired by learners, the effectiveness of support provided by the training institution, and the impact of the programme on learners' readiness and performance in the workplace. Supervisors are also asked to provide recommendations for enhancing the programme's effectiveness and improving the skills development of future learners. This feedback is crucial for maintaining strong partnerships with industry stakeholders and ensuring that training programmes adequately prepare learners for the demands of the railway sector.

3.1.4 Survey for Organiser – Short term survey

Organisers of pilot courses within the STAFFER project are asked to evaluate the initial implementation and outcomes of these training programmes. The survey examines course participation and completion statistics, the application of internal quality assurance systems, programme accreditation status, and opportunities for students to customise their learning experience. Feedback on the clarity and comprehensiveness of information provided to students about employment and career opportunities, as well as engagement with local and foreign employers, is also sought. Organisers are encouraged to provide suggestions for enhancing programme accessibility and effectiveness in meeting industry demands, thereby ensuring continuous improvement and relevance of the training initiatives.

3.1.5 Survey for Organiser – Long term survey

Organisers of STAFFER project programmes are engaged in a long-term evaluation aimed at assessing the impact of training programmes on graduates' careers in the railway sector. The survey gathers information on graduates' employment outcomes, roles performed in professional settings, employer satisfaction with their skills and competencies, and mechanisms for identifying ongoing training needs. Organisers are asked to reflect on the effectiveness of the programme in meeting industry demands and to provide recommendations for programme improvement and alignment with future industry trends. This feedback plays a crucial role in shaping the strategic

direction of future training initiatives and ensuring their sustained relevance and impact in the railway sector.

3.2 Evaluation framework and methodology

The analysis and evaluation of the survey for the implemented training programmes will be based on several key indicators to ensure a comprehensive assessment. These indicators include:

- **Participant Satisfaction:** Evaluating how satisfied the participants are with various aspects of the training programmes.
- **Learning Outcomes:** Assessing the extent to which the training programmes have achieved their educational objectives and enhanced the participants' knowledge and skills.
- **Relevance and Applicability:** Determining how relevant and applicable the course content is to the participants' current and future professional roles.
- **Instructor/Trainer Effectiveness:** Reviewing the effectiveness of the instructors and trainers in delivering the course content and facilitating learning.
- **Programme Design and Structure:** Analyzing the overall design and structure of the training programmes to ensure they are well-organised and conducive to learning.
- **Engagement and Participation:** Measuring the level of engagement and participation from the students throughout the course.
- **Impact on Performance:** Assessing the impact of the training on the participants' performance and professional development.
- **Feedback and Suggestions for Improvement:** Collecting and analyzing qualitative feedback from participants to identify areas for improvement and enhancement.

Quality values could include:

- **Effectiveness:** Measuring how well the training achieves its intended outcomes.
- **Efficiency:** Evaluating the cost-effectiveness of the training.
- **Relevance:** Ensuring the training content meets the needs of the participants and the organization.
- **Sustainability:** Assessing the long-term benefits and applicability of the training.

Based on these evaluations, a series of recommendations will be provided at the end of the survey analysis to further enhance the training programmes and ensure they continue to meet the evolving needs of the railway sector and its workforce.

4 FOR.FER SRL

4.1 Introduction

For.Fer Srl is an Italian professional training center recognised by the National Agency for the Safety of Railways and Road and Highway Infrastructures (ANSFISA), in accordance with Legislative Decree No. 50 of May 14, 2019. The center's primary mission is to provide specialised training programmes aimed at acquiring and maintaining qualifications and skills for personnel involved in railway traffic safety activities. For.Fer Srl plays a crucial role in the Italian railway industry by delivering targeted training programmes for a variety of roles, including train operators, maintenance staff, and both passenger and freight train drivers.



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FIGURE 1- MARKETING FLYER PUBLISHED ON FOR.FER SRL OFFICIAL LINKEDIN ACCOUNT ON 30TH APRIL 2024

For.Fer Srl's partners include Ferrotramviaria SpA, Ferrovie del Gargano Srl, DITS Srl (Development & Innovation in Transport Systems), Astra Service Srl, and SSIF SpA (Società Subalpina Imprese Ferroviarie). The center is recognised for all railway traffic safety activities in accordance with ANSF Decree No. 4 of August 9, 2012. DITS Srl is a spin-off company founded by researchers from Sapienza University of Rome's Department of Civil, Construction, and Environmental Engineering (DICEA), and is a partner in the STAFFER project.

For.Fer Srl offers vocational training courses for a variety of roles, including shunting locomotive driver, train preparer, facility operator, multifunctional locomotive driver, train conductor, railway vehicle maintenance technician, infrastructure maintenance technician, train attendant, and traffic circulation manager.

As an active member of Task 6.5, For.Fer Srl implemented four training programmes:

- **Basics of Railway Techniques (new training programme)**
- **Train Preparer**
- **Train Attendant**
- **Train Driver (selected as the pilot programme)**

The European Train Driving License course will incorporate new content designed to train drivers to address emerging technological advancements, trends, and evolving skill requirements, particularly in response to the digital transformation of the railway sector.

4.2 Basics of Railway Technics

The aim of this new course is to provide students with foundational knowledge in railway systems, thereby facilitating their engagement with more advanced courses or enhancing their chances for placement within a railway company. By the end of the course, learners will gain a solid understanding of railway concepts, which will help them confidently approach job interviews in the railway sector or pursue further professional training, such as programmes for train drivers, train attendants, or train preparers.

The detailed programme description can be found in ANNEX 1.1.1.

4.3 Train Preparer Training Programme

4.3.1 Overview

The Train Preparer Training Programme is designed to provide participants with the essential skills and knowledge needed for the effective preparation and management of railway trains. This programme covers a broad spectrum of competencies, including the operation of braking systems, train composition management, and adherence to regulatory standards.

4.3.2 Training Objectives

The primary objective of this course is to train individuals to proficiently manage and operate the braking devices of railway trains, considering their composition and the state of the railway route. Participants will learn to operate manual exchanges, manage the composition and decomposition of trains, and verify the proper loading and compliance with permissible footprints. This holistic training ensures that trainees are well-prepared to handle all aspects of train preparation with precision and safety.

The training sessions are conducted by experienced instructors recognised by ANSFISA. The programme spans 48 days, scheduled from Monday to Friday, with some non-consecutive days to accommodate various training modules. The course is delivered in-person to provide hands-

on experience and direct interaction with the instructors. Upon successful completion of intermediate and final assessments, and meeting the mandatory attendance requirement, participants will receive a Certificate of Training.

4.3.3 Specialised Roles

The Train Preparer training programme is divided into three specialised roles, each focusing on different aspects of train preparation:

1. **PDT-A (Maneuver):** Participants will learn to carry out the coupling and uncoupling of vehicles during preliminary operations, such as pre-routing and controlling the maneuver of trains.
2. **PDT-B (Trainer):** This role involves detecting the technical characteristics of vehicles, conducting necessary operations for compiling train escort documents, and adhering to technical prescriptions.
3. **PDT-VE (Verifier):** Trainees will be trained to verify the integrity of all components, ensure compliance with vehicle profiles, and inspect electrical and pneumatic systems. They will also learn to perform brake tests and ensure the execution of these tests is accurate and reliable.

By the end of the training, participants will have mastered:

- **The role and responsibilities of a train preparer**
- **Techniques for coupling, uncoupling, and parking vehicle**
- **Preparation and pre-routing processes**
- **Commanding maneuvering movements**
- **Detecting technical characteristics of vehicles and cargo**
- **Compiling train escort documents**
- **Conducting technical inspections and brake tests**

4.3.4 Eligibility Criteria and Selection Process

To be eligible for the Train Preparer Training Programme, candidates must meet several key criteria. Firstly, applicants must be at least 18 years old, ensuring they possess the maturity and responsibility necessary for the role. Candidates must possess a minimum educational qualification of a Middle School License, which provides a foundational level of education suitable for this role. Additionally, for candidates who obtained their qualifications abroad, a B2 level proficiency in Italian is required, certified by an accredited body. This language requirement ensures that all participants can fully engage with the course materials and instructions.

While these are the mandatory prerequisites, certain qualifications are preferred to enhance the candidacy of applicants. Ideally, candidates should hold a secondary education diploma with a minimum grade of 72 out of 100 or 43 out of 60. Alternatively, a higher education degree, such as a three-year diploma, is also acceptable. These educational benchmarks ensure that candidates have a solid academic foundation.

Moreover, a type B driving license is preferred, reflecting the practical nature of the training and the potential need for vehicle operation. Lastly, basic computer knowledge is advantageous, as it equips candidates with the necessary skills to handle various technological aspects of the training and future job responsibilities.

These comprehensive admission requirements are designed to select candidates who are not only academically and technically capable but also prepared for the practical and linguistic demands of the Train Preparer role.

Candidates must also pass a medical examination to verify their physical suitability for the role, as per EU Regulation 773/2019. This examination will be conducted at an RFI (Rete ferroviaria italiana) Territorial Health Unit.

For.Fer reserves the right to conduct a selection process based on qualifications and psycho-attitudinal evaluations, with criteria communicated in advance if necessary.

The detailed programme description can be found in ANNEX 1.1.2.

4.4 Train Attendant Programme Overview

4.4.1 Overview

The primary objective of the train attendant (Capotreno) training programme is to equip participants with the necessary skills and knowledge to ensure train readiness and adherence to safety standards. Additionally, attendants will be trained to provide passenger service on regional and long-distance trains, including ticket verification and issuance, and maintaining passenger comfort.

4.4.2 Training Objectives

The course will be taught by experienced instructors recognised by ANSFISA. The training spans 23 days, held from Monday to Friday, though the days may not be consecutive.

The course aims to develop the following skills in students:

- **Ensuring Passenger Safety:** Conducting operations that comply with train characteristics, service requirements, and operating conditions to ensure the safety of passengers, workers, and third parties. This includes activities that guarantee passenger



safety during boarding, alighting, and all travel stages, managing on-board systems for comfort, and providing necessary information about travel irregularities and emergencies.

- **Coordination:** Coordinating on-board activities and interfacing with the operating agent regarding service organization.
- **Infrastructure Operations:** Performing specific infrastructure-related operations, such as maneuvering diverters and other mechanisms, in emergencies or as required by operational regulations or the train company's service organization.
- **Documentation:** Modifying and preparing train documents as necessary, especially in emergency situations.

4.4.3 Eligibility Criteria and Selection Process

To be eligible for the Train Attendant training programme, candidates must satisfy several key admission requirements at the time of their application. First and foremost, applicants must be at least 18 years old, ensuring they meet the age criteria necessary for participation. Additionally, candidates must possess a minimum educational qualification of a Middle School License, which provides a foundational level of education suitable for this role. For those who have obtained their qualifications abroad, it is imperative to demonstrate proficiency in the Italian language at a B2 level, certified by an accredited body. This language requirement ensures that all participants can effectively engage with the course material and perform their duties in an Italian-speaking environment.

Physical and psycho-aptitudinal suitability will be verified in accordance with EU Regulation 773/2019 before the course begins, through a medical examination conducted at an RFI Territorial Health Unit.

The detailed programme description can be found in ANNEX 1.1.3.

4.5 Train Driver – STAFFER Pilot Programme

4.5.1 Description of the Train Driving Programme

4.5.1.1 Overview

The train driver is authorised to safely operate trains to their destinations while adhering to scheduled departure and arrival times. They possess in-depth knowledge of the vehicles they operate, the characteristics and regulations of the routes they traverse, as well as safety and emergency procedures. Currently, the trainings are operated on diesel and electric vehicles on both conventional and high-speed rail lines.





FIGURE 2 - TRAIN DRIVER PROGRAMME POST ON FOR.FER SRL WEBSITE

4.5.1.2 Learnings' Objectives

Upon completing the module, students will acquire theoretical skills in:

- **Understanding railway techniques, including safety principles and operational regulations.**
- **Identifying risks associated with railway operations and the methods available for managing them.**
- **Familiarity with railway infrastructure, focusing on track components, signaling systems, and fuel systems.**
- **Understanding railway vehicles, including train composition and technical requirements for locomotives, wagons, and carriages.**

The examination for obtaining the European Conductor License involves a presence-based evaluation conducted by a committee appointed by ANSFISA, comprising three examiners. The evaluation includes both written and oral tests.

The Complementary Certificate in Category A1-A4 allows holders to operate shunting locomotives or other locomotives used for shunting, while Category B enables operation of freight and passenger trains on rail lines.

Upon completion of the course, students will have learned:

- **Practical railway techniques, including safety principles and operational regulations applicable to their work contexts.**
- **Procedures and protocols for managing risks during shunting operations, and understanding various shunting modes.**
- **Knowledge of shunting locomotives and other vehicles used in shunting.**
- **Procedures related to train departure and arrival, as well as communication during line operations.**
- **Managing abnormal train movements and emergency procedures.**

4.5.1.3 Eligibility Criteria and Selection Process

When applying for enrollment, candidates are required to fulfill several mandatory criteria. They must be at least 18 years old (20 years for the European License). Additionally, they need to have completed a five-year secondary education diploma recognised in Italy or an equivalent qualification. Proficiency in Italian at B2 level, certified by an accredited body, is also mandatory for candidates who have obtained their qualifications abroad.

In addition to these requirements, preferred qualifications include a secondary technical education diploma with a minimum grade of 72/100 or 43/60, or a higher education diploma of at least three years. Candidates should also possess a Type B driving license and have basic computer skills.

Physical fitness evaluation, ensuring exemption from conditions affecting job performance (as per Legislative Decree 247/2010), may be conducted prior to course commencement at designated RFI Territorial Health Units.

The detailed programme description can be found in ANNEX 1.1.4.

4.5.2 Train Driver Resources and Materials

Training materials used for the train driver course are presentations, handouts, manuals, training summary, or digital resources. The train driver's license manual full index is found in ANNEX 3.1. The English translations of the abstract and Chapters 1 and 2 of the courses are available upon request.

In terms of resource allocation, For.Fer's training facilities are equipped with a multimedia blackboard, a projector and projection screen, and a multimedia audio-video system. Additionally, For.Fer provides a thematic library for trainees, a static train driving simulator, and a showcase featuring components related to rail vehicle maintenance.



FIGURE 3 - STATIC TRAIN DRIVING SIMULATOR INSTALLED AT FOR.FER SRL

4.5.3 Training Delivery and Evaluation Mechanisms

The training sessions are conducted by instructors recognised by ANSFISA, university professors, and industry professionals with proven technical experience. Pre-training assessments include procedures for evaluating participants before training begins, helping to gauge their existing knowledge and skills. Typically, a curriculum review of learners is conducted by an instructor as part of the Training Needs Analysis, which is documented on special forms entered into the management system. Occasionally, For.Fer also administers assessment tests prior to the start of training to evaluate participants' existing knowledge and soft skills, especially when the number of applicants exceeds the available places.

Regarding evaluation and feedback mechanisms, and as required by the training management system, an evaluation questionnaire is administered to trainees at the end of each course to monitor quality and satisfaction. The questionnaire is structured into different sections to assess the communication of the event, the registration process, the comfort and equipment of the classrooms, the availability of the staff, and the performance of the lecturer. Trainees are also asked for an overall evaluation of the course and suggestions for improvement.

4.5.4 Compliance and legal requirements

Compliance and legal requirements ensure that the training programme adheres to relevant laws, regulations, and industry standards. Specifically, the training programme is prepared in accordance with Legislative Decree 247/2010, which implements Directive 2007/59/EC on the certification of train drivers operating locomotives and trains within the Community railway system, as amended by Ministerial Decree July 4, 2016. The training programme is also conducted under ANSF Decree 4/2012 (covering all safety activities), ANSF Decree 8/2011 (specific to train driving), ANSF Decree 14/2009 (regarding instructor recognitions), and Guidelines 7/2010 (regarding the recognition of training centers).

4.5.5 Survey Analysis Report for Train Driver Courses

The Train Driver training programme, conducted by For.Fer srl, was evaluated through surveys targeting students, teachers, and in-company supervisors. This section provides a comprehensive analysis of the survey results, organised by key evaluation indicators and criteria. The surveys' results are listed in Annex 2.1.

The Train Driver training programme has been implemented in three places:

- **Higher Technical Institute for Sustainable Mobility (Istituto Tecnico Superiore per la Mobilità Sostenibile – ITS MOST) – Ortona**
- **Mercitalia Shunting & Terminal - Verona**

- **Mercitalia Shunting & Terminal - Rome**

Regarding Mercitalia S&T, the students were already employed by the railway company and only needed to obtain their Train Driving License. In contrast, the course at ITS MOST involved students who were not yet hired but were part of a two-year programme that included the "Train Driver" course.

4.5.5.1 Participant Satisfaction

The overall satisfaction among students varied significantly across the three locations. Students in Ortona and Rome reported high levels of satisfaction with their courses, reflecting positively on the structure and delivery of the training. Students in Verona were less satisfied, indicating potential areas for improvement. The majority of students expressed willingness to recommend the courses to others, with the highest recommendation rates from Rome.

Teachers consistently reported high satisfaction with the course's ability to teach railway-related professional skills and prepare students for future roles. This indicates that the curriculum is well-aligned with industry needs and effectively delivered by the instructors.

Supervisors were generally satisfied with the knowledge and skills acquired by the trainees, although they highlighted that there is room for improvement in certain areas, particularly in preparing students for their current responsibilities within the organization.

4.5.5.2 Learning Outcomes

Most students felt that their existing knowledge was sufficient to understand the course topics, although there were some discrepancies between locations. While the objectives of the courses were generally clear, the perceived achievement of these objectives varied, with students in Rome feeling the most confident about having met the course goals.

Teachers affirmed that transversal skills were explicitly taught and assessed in most cases. They also reported that the courses actively supported students in reflecting on and reviewing their accomplishments throughout the programme.

Supervisors observed that the training had a positive impact on the trainees' performance, although they suggested that further emphasis on practical, work-related activities could enhance the overall learning experience.

4.5.5.3 Relevance and Applicability

Students, especially those in Rome, felt that the course was highly relevant to their professional aspirations. This indicates that the course content is closely aligned with the skills and knowledge required in the railway sector.

Supervisors emphasised the need for additional training in computer skills to better prepare students for the technological demands of the job. This feedback highlights the importance of updating the curriculum to include relevant digital competencies.

Teachers were confident that the course content was highly relevant to the railway sector and well-prepared students for their future roles.

4.5.5.4 Instructor/Trainer Effectiveness

Students in Rome rated the teaching methods very highly, indicating that the instructors were effective in conveying the course material. However, students in Verona were less satisfied with the teaching methods, suggesting a need for improvement in instructional techniques in that location.

Teachers were consistently praised for their engagement and passion, particularly in Rome, where students felt that the instructors were able to convey their knowledge and enthusiasm effectively.

4.5.5.5 Programme Design and Structure

The clarity of course objectives was rated highly across all locations, with Rome receiving the highest marks. However, there were suggestions for improvement in the structure and delivery of the course, particularly in Ortona, where students called for better training materials and clearer course organization.

The training institution, For.Fer srl, received positive feedback for its internal quality assurance systems and accreditation status. However, students did not have opportunities to customise their course content or engage in visits to local or foreign employers, indicating potential areas for programme enhancement.

4.5.5.6 Engagement and Participation

Students appreciated the shared experiences and interactions with professionals, which contributed significantly to their knowledge development. This aspect was particularly valued in Ortona and Rome, where students felt that these interactions enhanced their learning experience.

4.5.5.7 Impact on Performance

Supervisors reported that the training had a positive impact on the trainees' performance, although there was room for improvement in preparing students for specific job responsibilities. This feedback suggests that while the training is effective, it could benefit from a more targeted approach to practical skill development.

4.5.5.8 Feedback and Suggestions for Improvement

Students provided constructive feedback, particularly in Ortona and Verona, calling for better training materials, clearer course structures, and improved time management. These suggestions highlight areas where the programme can be refined to better meet student needs.

Supervisors recommended the inclusion of computer skills training to enhance the practical applicability of the course. This feedback underscores the importance of keeping the curriculum aligned with technological advancements in the railway sector.

For.Fer srl employed strategies such as discounts and trade shows to enhance access to the programme. However, there is room for improvement in areas such as offering customizable course content and facilitating employer interactions.

4.5.5.9 Quality Values

Effectiveness

The training programmes were generally effective in achieving their intended outcomes, as evidenced by high satisfaction rates in Ortona and Rome.

Efficiency

The training programme appears cost-effective, given the successful completion rates and high satisfaction in critical areas. However, improving efficiency in Verona will require addressing the specific issues identified in the feedback.

Relevance

The training content was highly relevant, meeting the needs of participants and the organization. This is particularly true for the professional relevance and preparation for future roles, as highlighted by the supervisors and teachers.

Sustainability

The long-term benefits and applicability of the training were affirmed through high grades in areas related to professional relevance and preparation for future roles. Ensuring continuous feedback from all stakeholders will help maintain and enhance the programme's sustainability.

4.5.6 Recommendations

Based on the comprehensive analysis of the survey results presented in Annex 2.1, several key recommendations have emerged to enhance the effectiveness and relevance of the Train Driver training programme under the STAFFER project. These recommendations are aimed at

addressing specific areas for improvement identified across student, teacher, in-company supervisor, and organiser surveys. We can list:

- **Improve Teaching Materials:** by providing more comprehensive and paper-based resources.
- **Enhance Instructor Methods:** Focus on improving teaching methods in Verona to align with the higher satisfaction seen in Ortona and Rome.
- **Incorporate Computer Skills:** Introduce modules on computer skills to better prepare learners for the instrumentation used in their work environment.
- **Increase Employer Interaction:** Facilitate more opportunities for students to engage with local and foreign employers through visits and virtual meetings.
- **Continuous Feedback:** Regularly update the programme based on detailed feedback from students, teachers, and employers to ensure it remains aligned with industry needs and standards.

4.5.7 Conclusion

The STAFFER project's Train Driver training programme has demonstrated significant strengths, in Ortona and Rome. High levels of satisfaction, effective teaching methods, and relevant course content were consistent highlights. The Verona location requires little attention to improve teaching methods and overall student satisfaction. Suggestions for improvement include enhancing training materials, incorporating more computer skills, and ensuring clearer communication about course structure and objectives. The successful completion rates and high grades in critical areas highlight the programme's overall effectiveness, efficiency, relevance, and sustainability, supporting its continued implementation and refinement.

Throughout the implementation of the Train Driver training programme, For.Fer Srl has demonstrated commendable commitment and expertise in organizing and facilitating these educational initiatives. Their dedication to quality assurance, as evidenced by their robust internal systems and accreditation of the pilot programme, underscores their proactive approach to ensuring programme excellence. Moreover, For.Fer Srl's provision of clear and comprehensive information about employment and career opportunities within the railway sector has greatly benefited students, enhancing their understanding of future professional pathways. Their active engagement with major employers and regular updates based on industry feedback highlight For.Fer Srl's responsiveness to evolving market demands and commitment to fostering meaningful connections between students and prospective employers. Moving forward, building upon these strengths will further solidify For.Fer Srl's role in shaping a skilled workforce equipped to meet the challenges of the railway sector's future.



5 HIGHER TECHNICAL INSTITUTES MÖDLING AND RENNEWEG

5.1 Overview of the Austrian Education System

The Austrian education system is structured and comprehensive. It includes:

- 1. Compulsory Education:** Education is mandatory for children aged 6 to 15. They attend primary school for four years, followed by four years of lower secondary school (Hauptschule or New Middle School).
- 2. Secondary Education Options:** After completing lower secondary school, students can choose from several secondary education paths:
 - **General Education (AHS):** Students may attend a general education high school (Allgemeinbildende Höhere Schule or AHS) for four to eight years, depending on the type of AHS.
 - **Vocational Education (BMS/BHS):** Students may attend a vocational school (Berufsbildende Mittlere Schule or Berufsbildende Höhere Schule) to prepare for a specific profession. HTL Mödling and HTL Renneweg fall into this category.
 - **Apprenticeship:** Students can also opt for an apprenticeship program, which combines practical training with classroom instruction.

Höhere Technische Lehranstalt (HTL - Higher Technical Institute) is a vocational school focusing on technical education. It offers a five-year program that prepares students for careers in engineering, IT, electrical engineering, mechatronics and other technical fields. The curriculum includes general education subjects alongside specialised technical subjects. Students typically choose a department based on their interests, such as mechanical engineering, electrical engineering, or information technology. Internships or practical training are often part of the curriculum, providing students with real-world experience in their chosen field. After completing the five-year program, students may take the Matura exam, which is necessary for university admission in Austria. Alternatively, they can enter the workforce directly or engage in apprenticeships or other vocational training programs.

Training programs at HTLs are governed by federal law. For example, the Mechatronics curriculum is regulated by "Federal Law Gazette II No. 262/2015, last amended by Federal Law Gazette II No. 235/2019," and the Information Technology curriculum is guided by "Federal Law Gazette II No. 262/2015, last amended by Federal Law Gazette II No. 273/2019." To ensure a higher degree of flexibility, the adopted rail-specific courses selected in Task 6.5 implementation will be microcredential training programs.



5.2 HTL Mödling

HTL Mödling, founded in 1873 and located in Mödling, stands as one of Austria's premier institutions for technical education. Over the years, HTL Mödling has evolved to become the largest technical school in Austria, renowned for its comprehensive programs and state-of-the-art facilities.

HTL Mödling offers a rigorous five-year program designed to equip students with both theoretical knowledge and practical skills in various technical fields. The curriculum is a balanced blend of general education subjects and specialised technical courses, ensuring that students receive a well-rounded education. As mentioned, upon completion of the program, students are eligible to take the Matura exam, a critical requirement for university admission in Austria.

Students at HTL Mödling can choose from a wide range of specialised departments based on their interests and career aspirations. Some of the key departments include:

- Mechanical Engineering
- Electrical Engineering
- Information Technology
- Civil Engineering
- Industrial Engineering

HTL Mödling emphasises also on practical training. The institute collaborates with numerous industries and companies, offering students opportunities to participate in internships and hands-on projects.

As partner in STAFFER project, HTL Mödling will implement the micro-credential Rail specific Drive systems as well the mandatory internship. These training programmes are under the supervision of the Electrical Engineering Department. The department prepares students to tackle robotics, electromobility, sustainable energy production and smart city development. The department equips students with the skills and knowledge necessary to excel in a wide range of cutting-edge fields. The electromobility focuses on sustainable transportation solutions. And the two implemented training programmes are part of the electromobility section.

The details of the selected training programs by HTL Mödling are provided in ANNEX 1.2.

5.3 HTL Rennweg

HTL Rennweg is an educational institution located in Vienna, Austria. HTL Rennweg offers a diverse range of programs designed to meet the evolving needs of the industry and society.

The institute provides a five-year program that integrates academic coursework with hands-on practical training. Students at HTL Rennweg can choose from a variety of specialised departments. Key specializations include:

- Mechanical Engineering
- Electrical Engineering
- Information Technology
- Civil Engineering
- Mechatronics
- Industrial Engineering

The institute collaborates closely with industry partners to provide students with internship opportunities and real-world projects. These internships, which are an integral part of the curriculum, allow students to gain valuable professional experience, apply their classroom knowledge, and build essential industry connections. Typically, students complete at least eight weeks of internship, ensuring they are well-prepared for the demands of the workforce.

As partner in STAFFER project, HTL Rennweg will implement, as HTL Mödling, the micro-credential Rail specific Drive systems as pilot programme as well the mandatory internship. These training programmes are under the supervision of the Mechatronic Department. HTL Rennweg also proposed the Railspecific IT Topics – Microcredential.

The details of the selected training programs by HTL Rennweg are provided in ANNEX 1.3.

5.4 Rail specific Drive systems pilot programme

The Rail specific Drive systems pilot programme is implemented by the HTL Rennweg and HTL Mödling.

The Drive System course, as defined in Federal Law Gazette II No. 262/2015 and last amended by Federal Law Gazette II No. 273/2019 under section B.4 Vehicle Technology, offers a comprehensive education in both general and rail-specific drive systems. This section is designed to equip graduates with the necessary knowledge and skills to excel in various aspects of vehicle and engine technology.

5.4.1 Drive System Course

The general drive system course focuses on several key areas:

- **Manufacturing Engineering:** Graduates gain a deep understanding of automotive engineering materials, including their structure, properties, and standards. They also learn to explain and select appropriate manufacturing processes specific to vehicle technology.
- **Machinery and Equipment:** In this area, graduates become proficient in explaining the structure and operation of turbomachines and combustion engines, assessing their energy efficiency, and developing solution concepts. They also learn to select and explain sensors, controls, and regulations essential for engine and vehicle control, as well as understand various forms of electromobility.
- **Vehicle and Engine Technology:** This field covers the basics of vehicle mechanics, including the structure and function of the drive train, chassis components, and chassis control systems. Graduates assess their influence on driving behavior and understand the design principles of car bodies and relevant safety regulations. They also evaluate energy efficiency types and modes, explain gas exchange controls and their influence on operating behavior, and understand the systems required to operate an engine and design drive units.
- **Electrical Engineering:** Learners delve into the principles of electric drives, select suitable electric drives, and investigate the basic behavior of electrical circuits in three-phase systems. They create control-related programs, recognise the devices and processes of control technology, and explain communication technology devices and processes. Additionally, students learn to design and select sensors for various applications, explain the function of measuring devices and circuits, and evaluate and interpret measurement data. The curriculum includes application-oriented electrical machines, generators, and electromobility.

5.4.2 Microcredential Rail-Specific Drive System Course

The Rail-Specific Drive System course aligns with ÖBB's ambitious goal of achieving CO₂-neutral mobility by 2030. With 73% of Austria's railway lines already electrified, the challenge lies in ensuring CO₂-neutral operation for the remaining non-electrified network. This course explores various alternative drive technologies designed to meet this challenge. One approach involves retrofitting and operating the existing fleet with combustion engines powered by bio/e-fuels. Another innovative solution is the development of eHybrid vehicles equipped with traction batteries and pantographs, enabling battery charging under electrified sections of the track and operation on non-electrified segments. Additionally, the course examines the potential of vehicles that combine traction batteries with hydrogen fuel cells, necessitating onboard hydrogen tanks and supporting refueling infrastructure. Through these technologies, the course

aims to provide students with the knowledge and skills to contribute to the sustainable future of rail transportation.

The rail-specific drive system course provides specialised knowledge tailored to the rail industry:

- History of (Electric) Rail Vehicle Technology
- Direct Current (DC) Systems
- Three-Phase Current (3~AC) Systems
- Single Phase AC Current Systems
- Traction Power Generation
- Construction of Modern Three-Phase Locomotives
- Power Electronics as Key Technology in Modern Electric Locomotives
- Main Circuit of Three-Phase Locomotives
- Traction Transformer and Converter of Three-Phase Locomotives
- Voltage Intermediate Circuit: DC Link Capacitors, Ground Fault Detection, Short Circuiter, Suction Circuit
- Pulse Inverter
- Traction Motor of a Three-Phase Locomotive
- Multi-System Locomotives
- Alternative Drive Technologies

The drive system course at HTL Rennweg and HTL Mödling prepares students for a dynamic career in both automotive and rail industries, providing a solid foundation in vehicle mechanics, manufacturing processes, electrical engineering, and specialised rail technology.

5.4.3 Survey Analysis Report for Rail Specific Drive System Microcredential Course

The STAFFER project aims to develop educational programs that equip learners with essential skills and competencies required in the railway sector. Work Package 6 focuses on implementing training programs and work-based internships. Two pilot courses, the Rail Specific Drive System Course, were implemented at HTL Mödling and HTL Rennweg, both Austrian higher technical institutes. Surveys were conducted among students, teachers, and organisers to evaluate these programs. This report analyzes the survey results, providing comprehensive feedback and insights for program improvement based on participant satisfaction, learning outcomes, instructor effectiveness, program design, and other key indicators.

5.4.3.1 Participant Satisfaction

Students from both HTL Mödling and HTL Rennweg expressed a high level of satisfaction with the course. They particularly appreciated practical demonstrations and hands-on experiences, such as facility visits and seeing different types of motors in action. The support from instructors was highly valued, and the information provided about the program was deemed clear and comprehensive. However, HTL Mödling students noted that study materials could be more comprehensive, while HTL Rennweg students suggested improving explanations and the introductory context of the course.

5.4.3.2 Learning Outcomes

Overall, students felt that their technical skills improved significantly due to the course. The shared experiences and hands-on activities contributed greatly to their knowledge development. However, HTL Mödling students indicated a need for more detailed study materials, whereas HTL Rennweg students suggested starting with more basic explanations to enhance understanding. Both groups agreed that expanding the course duration could cover topics more thoroughly and enhance learning.

5.4.3.3 Relevance and Applicability

The courses were seen as beneficial for students' job and academic pursuits, though HTL Rennweg students felt less strongly about its professional relevance compared to HTL Mödling students. Both groups appreciated the practical aspects of the course, such as real-life work procedures and facility visits. HTL Mödling students emphasised the need for tailored study materials, while HTL Rennweg students highlighted the importance of clearer career-focused content.

5.4.3.4 Instructor/Trainer Effectiveness

Instructors were praised for their effectiveness in delivering course content and supporting students' learning across both institutions. The teaching methods used were effective in making complex concepts easy to understand. There was active encouragement and support for students to reflect on and review their accomplishments throughout the program. However, both groups suggested that more detailed explanations and better introductory context could further improve the learning experience.

5.4.3.5 Program Design and Structure

The structure of the program was well-received by students from both HTL Mödling and HTL Rennweg, with clear objectives and sufficient lessons to understand the course topics. The integration of realistic simulations and work-related learning activities provided valuable

practical experience. Both groups suggested improvements in study materials and the communication of work-related activities to enhance their learning experiences.

5.4.3.6 Engagement and Participation

Both courses actively engaged students in reflection and review of their accomplishments. The programs included opportunities for students to visit local and foreign employers, participate in job fairs, and access online resources related to employability. Organizers maintained active communication with employers and used alumni networks to track graduates' employment, further supporting student engagement and participation.

5.4.3.7 Impact on Performance

Teachers observed significant improvements in students' performance, noting that the programs effectively prepared them for future professional roles within the railway sector. The integration of transversal skills, professional attitudes, and work-related learning activities contributed to this improvement. However, there was feedback suggesting that better communication of these activities to students could enhance their practical learning experiences.

5.4.3.8 Completion and Certification

The programs had high completion rates, with the majority of students successfully completing the courses. Internal quality assurance systems were actively applied, ensuring that the programs met their objectives and maintained high standards. However, both groups suggested explicitly instructing management skills and involving employers in program reviews to enhance their overall effectiveness.

5.4.3.9 Feedback and Suggestions for Improvement

Students, teachers, and organizers provided valuable feedback for program improvement. Suggestions included enhancing study materials, providing more detailed contextual explanations, expanding the course duration, and improving the communication of work-related learning activities. HTL Mödling students also emphasised the need for tailored study materials, while HTL Rennweg students highlighted clearer career-focused content and more basic explanations.

5.4.3.10 Quality Values

Effectiveness

The training programs effectively achieved their intended outcomes, with high satisfaction rates and significant improvements in students' technical skills and knowledge.

Efficiency

Both programs were cost-effective, with high completion rates and active quality assurance systems ensuring the programs met their objectives.

Relevance

The courses were relevant to students' professional aspirations and academic pursuits. However, there is room to enhance the relevance by improving study materials and providing more detailed contextual explanations.

Sustainability

The long-term benefits and applicability of the training programs were evident through high employer satisfaction and active engagement with industry partners. Regular updates based on employer feedback and labor market needs ensured the programs remained relevant and sustainable.

5.4.4 Conclusion and Recommendations

The Specific Rail Drive System course training programme at HTL Mödling and HTL Rennweg have been successful in achieving their goals, as evidenced by high satisfaction rates, significant improvements in technical skills, and strong professional relevance. To further enhance the effectiveness and impact of the Rail Specific Drive System Course at HTL Mödling and HTL Rennweg, several key recommendations are proposed based on the survey findings and feedback from students, teachers, and organizers:

- **Enhance Study Materials:** It is recommended to improve the quality and comprehensiveness of study materials provided to students. This enhancement should aim to better support understanding and relevance of the course topics. By developing more detailed and robust study materials, students can deepen their knowledge and skills in the railway sector.
- **Increase Contextual Explanations:** Providing more detailed explanations of the course context and objectives is essential to enhance students' initial understanding. Clearer communication of the course's purpose and its relevance to their future careers will help students engage more effectively with the material from the outset.
- **Strengthen Employer Involvement:** To ensure the training programs align closely with industry needs, it is recommended to involve employers more actively in program reviews and feedback processes. By seeking regular input from industry partners, the courses can be continuously updated to reflect current trends and requirements in the railway sector.

- **Expand Course Duration:** Considering the suggestion from students to expand the course duration would allow for more in-depth coverage of topics. This expansion could address the need for additional learning time, enabling a more thorough exploration of complex concepts and practical applications within the rail industry.

5.5 Mandatory Subject - Rail Specific Internship

The STAFFER project is dedicated to fostering the development of essential skills and competencies required in the railway sector. As the leader of the task related to implementing pilot training programs in the rail sector at EQF levels 3-5, we are focused on bridging the gap between educational institutions and industry needs. HTL Mödling and HTL Rennweg, have taken significant strides in this direction by implementing a rail-specific internship program in collaboration with ÖBB Technische Services GmbH, a subsidiary of the Austrian Federal Railways (ÖBB).

5.5.1 Overview of the Internship Program

HTL Mödling and HTL Rennweg have collaborated with ÖBB Technische Services GmbH to offer their students an opportunity to engage in rail-specific internships. These internships are not only integral to the students' education but are also mandatory as per the legal requirements stipulated in section D of the Federal Law Gazette II No. 262/2015, last amended by Federal Law Gazette II No. 235/2019. According to this regulation, the internship must have a duration of at least eight weeks during the class-free period before the students enter their fifth year.

ÖBB Technische Services GmbH plays a pivotal role in this initiative. As a subsidiary of ÖBB, it specialises in the maintenance, repair, and servicing of rail vehicles and infrastructure. This entity is committed to ensuring that its technical staff are well-equipped with the necessary skills and knowledge to maintain and operate rail systems effectively. The training programs offered by ÖBB Technische Services are designed to provide hands-on experience and practical knowledge, ensuring that students are prepared for real-world challenges in the railway industry.

5.5.2 Educational and Teaching Objectives

The rail-specific internship program is designed to fulfill several educational and teaching objectives. It aims to bridge the gap between theoretical knowledge and practical application, enabling students to:

- **Undertake Professional Tasks:** Students are expected to take on tasks in professional practice based on the skills they have acquired so far. They are trained to pursue these



tasks purposefully, even in the face of unexpected difficulties and failures, and to complete them reliably and largely independently with the necessary perseverance.

- **Adhere to Standards and Regulations:** Students are trained to independently take into account relevant standards, safety regulations, and environmental standards, and to create the necessary documentation. This ensures that they are well-versed in the compliance requirements of the industry.
- **Integrate into Work Processes:** The internship program helps students integrate into the usual work processes and operating procedures of their profession. They learn to use the organizational skills they have acquired and to navigate the professional environment effectively.
- **Understand Employee Rights and Obligations:** As part of their professional activity, students are taught to consider the rights and obligations of an employee. This holistic approach ensures that they are not only skilled in their technical roles but also aware of their legal and ethical responsibilities.

5.5.3 Subject Matter and Practical Application

The subject matter of the internship is centered around job-specific tasks that require the largely independent application of the knowledge and skills acquired by the students. These tasks are designed to be realistic and reflective of a professional environment, including:

- **National Qualification Framework (NQF) Level 4 Tasks:** Students are engaged in tasks at NQF level 4, which are aligned with target and performance agreements, working hours according to relevant collective agreements.
- **Professional Integration:** The internship program emphasises the importance of recognizing and respecting roles within an operational organization. Students receive regular feedback to ensure continuous improvement and professional growth.
- **Feedback and Reflection:** Regular feedback sessions are conducted to help students reflect on their performance and identify areas for improvement. This iterative process ensures that they are continually developing their skills and adapting to the requirements of the industry.

5.5.4 Company Practice and Support

To support the students in fulfilling their educational and teaching tasks, the schools, HTL Mödling and HTL Rennweg, actively collaborate with suitable companies in the region. This partnership ensures that students have access to practical training opportunities that complement their academic learning. The companies, including ÖBB Technische Services GmbH, provide a



structured environment where students can apply their knowledge in real-world scenarios, thereby enhancing their learning experience.

5.5.5 Integration and Supervision of Students at ÖBB

5.5.5.1 Integration Process

Students from technical high schools specializing in mechanical engineering, mechatronics, and electrical engineering are integrated into ÖBB as summer interns through a structured process. The department heads communicate their need for interns to the HR department well in advance. Interns are then assigned to different departments according to a pre-arranged plan.

Upon arrival, the responsibility for informal integration into the department falls to the department head and their team. The following legal conditions apply to summer interns, who are classified as mandatory interns:

- The primary focus is on education and training, particularly the practical application of learning materials. There is no obligation to perform work tasks.
- Interns are not obligated to follow instructions from a legal standpoint.
- They are not formally integrated into the company's organizational structure.
- Interns must comply with company rules and safety regulations.
- Flexible working hours are allowed.
- Interns are not considered employees under labor law, and thus, labor law regulations do not apply.
- Interns are only covered by accident insurance.

Interns are supervised by the responsible department head and the assigned department throughout their internship. They gain their first experiences working on trains by accompanying employees and assisting them with daily tasks and small projects directly in the maintenance depot. Before starting any tasks, interns receive safety training and must bring their own S3 safety shoes and work clothes. They receive also a high-visibility vest and, if needed, additional equipment on site (e.g. helmet, goggles). They are only allowed to enter the maintenance depot and perform tasks if they have the necessary safety equipment. Heavy work is not permitted for interns.

5.5.5.2 Required Documentation

There is no employment contract for interns; instead, they receive an information letter from ÖBB-TS detailing the internship's key aspects such as location, duration, and supervisor contact details. Interns must sign a data protection declaration (NDA).

5.5.5.3 Evaluation

Interns are evaluated by the department head at the end of their internship. The evaluation report includes:

- **Key details about the internship:** This section provides a summary of the work areas and activities undertaken by the intern. It is given to the intern at the end of the internship as an internship confirmation letter.
- **Evaluation for HR:** This part rates the intern on several aspects:
 - **Technical knowledge:** Assessed according to the intern's academic level.
 - **Engagement, commitment, and interest:** Evaluates the intern's commitment, interest, and proactive involvement in tasks.
 - **Social behavior:** Observes the intern's ability to work within a team, communicate effectively, and maintain a positive work ethic.
- **Recommendation:** Provides an assessment of the intern's suitability for future employment at ÖBB-TS.

The evaluation and recommendation sections remain within the company, as they are relevant only to HR and the supervising manager.

This structured approach ensures that students gain valuable practical experience while complying with legal and safety requirements. The integration, supervision, and evaluation processes are designed to support students' learning and development in a real-world working environment.

5.5.5.4 Internship Statistics

ÖBB TS has committed to reserving 20 internship positions each year exclusively for students from HTL Mödling and HTL Rennweg. This ensures that a significant number of students gain practical experience in a real-world technical environment.

5.5.5.5 Safety Regulations for Interns

Ensuring the safety and well-being of interns is a top priority at ÖBB-Technische Services-GmbH (ÖBB TS). Below is a detailed outline of the safety regulations and procedures that interns are taught and required to follow.

Safety Instructions

According to "Employee Protection Act Instruction" (ArbeitnehmerInnenschutzgesetz Unterweisung) safety instructions must be provided by the manager on the first day of work. These instructions include detailed information on the following topics:

- **Fire Protection Regulations:** Clear guidelines on fire prevention and emergency procedures.
- **Obligation to Wear Personal Protective Equipment (PPE):** Interns must wear the required safety gear at all times.
- **General Behavior in the Workspace:** Expected conduct to maintain a safe and professional environment.
- **Operating Instructions:** Proper use of machinery and tools to prevent accidents.
- **Work Equipment:** Safe handling and operation of work-related equipment.
- **Hazard Labelling:** Understanding and recognizing hazard signs and labels.

Safety Equipment

Interns must be equipped with the necessary safety gear to ensure their protection while working. The required safety equipment includes Personal Protective Equipment (PPE) as:

- **S3 Safety Shoes:** Interns are required to bring their own S3 safety shoes. The "S3" classification is part of a European standard for safety footwear, specifically EN ISO 20345, which outlines the requirements and specifications for different levels of protection.
- **Work Clothes:** Interns must also bring their own work clothes appropriate for a technical work environment.
- **High-Visibility Vest:** Provided by ÖBB TS to ensure interns are easily seen in the workspace.
- **Additional Equipment:** If needed, interns will be provided with additional safety gear such as helmets and goggles on site.

This comprehensive safety protocol ensures that interns at ÖBB TS are well-prepared to work in a safe and controlled environment, adhering to all necessary safety regulations and standards. The commitment to safety and structured evaluation contributes to the overall effectiveness and quality of the internship program.

5.5.6 Survey Analysis Report for Mandatory Subject: Rail Specific Internship

The evaluation of this programme through short-term and long-term surveys provides valuable insights into its effectiveness and areas for improvement.

The short-term survey revealed a full success of all the interns, indicating a high retention and completion rate. HTL Rennweg employs robust internal quality assurance systems with a perfect score of 100/100, utilizing the IQES (Official Quality Assurance Tool for Austrian Schools). Students benefit from a highly customizable internship structure aligned with industry demands. The programme also excels in providing comprehensive information on employment and career opportunities to students. Opportunities for both local and international employer visits, including virtual visits, are available depending on the internship placement. Regular updates on job opportunities are facilitated through HTL3R innovation day and an online job board. However, areas for improvement include better guidance for students to engage with career services and clearer incorporation of employment and career data into programme information.

In the long-term survey, it was reported that graduates from the internship programme are employed in various sectors. IT graduates find employment in Internet Service Providers (ISPs), media production, and Small and Medium Enterprises (SMEs) as IT engineers, while mechatronics graduates secure roles in industrial automation, automotive industries, and mechanical construction. This diversity reflects the programme's success in preparing students for multiple career paths within the rail and related industries. Employers express high satisfaction with the skills and competencies of HTLs graduates. The institution actively identifies training needs through collaborations with industry leaders like Siemens and ÖBB in the IT and mechatronics sectors.

The surveys detailing the internship programme can be found in ANNEX 2.2.4.

HTLs Rail Specific Mandatory Internship programme demonstrates strong alignment with industry needs, providing students with practical experience and exposure to potential employers both locally and internationally. Moving forward, enhancing career guidance services and integrating clearer employment data into programme information will further strengthen the programme's impact and effectiveness.

6 CONSERVATOIRE NATIONAL DES ARTS ET METIERS

6.1 Introduction

The Conservatoire National des Arts et Métiers (CNAM) is a major French public institution dedicated to education and research in science, technology, and industry. Established in 1794, its original purpose was to provide technical education to workers and artisans to support industrial development in France. CNAM had approximately 80,000 students enrolled in various programmes, with over 200 different courses offered. The institution also had a network of

regional centres across France and internationally. The slogan of CNAM, expressing its guiding principle and belief, is “Docet omnes ubique” which means “He teaches everyone, everywhere”.

The National Pedagogical Team for Electronics, Electrotechnics, Automation, and Measurements (EPN03) of CNAM, involved in STAFFER project, consists of 42 teacher-researchers and 20 administrative and technical support staff. EPN03 offers an Electronic Systems - Railway Signalling (SESF, Systèmes Électroniques - Signalisation Ferroviaire) engineering degree accredited by the Commission des Titres d'Ingénieur (CTI) at EQF Level 7. The program is also QUALIOP1 certified, demonstrating its commitment to delivering high-quality training and services.

6.2 Continuous and Apprenticeship Training programmes

CNAM have two types of professional training programmes: continuous and apprenticeship. Continuous professional training is a tool that allows employees or job seekers to improve or update their knowledge, acquire new skills to ensure their employability, or prepare for a career reconversion. The training can be carried out according to the pace of each individual. It adapts to the specific needs of each individual in training. Various modes of instruction are available, including distance learning, evening classes, work-study programmes, and e-learning. The “auditor” (designation that typically refers to individuals enrolled in evening classes) undertakes the training outside of regular working hours, usually in the evenings, on weekends, and during free time.

The apprenticeship programmes, stated as Initial Training under Apprentice Status, at Cnam are implemented according to EC definitions. Typically, apprentices divide equally their time between learning at the institution and training in a company. They usually have a contract with the company and receive payment for their work. In France, there are two primary legally acknowledged apprenticeship schemes:

- **Apprenticeship Contract ('Contrat d'apprentissage')**: This is a specific type of employment contract introduced in France in 1919 and redefined in 2018. It is used for vocational training combining work-based and school-based education.
- **Professionalisation Contract ('Contrat de professionnalisation')**: Established in 2004, this scheme was preceded by a similar scheme called the ‘Contrat de qualification’. It is aimed at enhancing vocational skills and qualifications relevant to the labor market.

These schemes are regulated under the French Labour Code (Articles L6211-1 to L6261-2) and are supported by laws and regulations that facilitate apprenticeship training in various fields.

Under the apprenticeship programme, Cnam offers an EQF 7 engineering degree in Electronics Systems, specializing in Railway Signalling. The training programme focuses on designing and operating signaling systems integrated into embedded architectures within the dynamic environments of railway operations. Apprentices develop essential technical, scientific, and technological competencies in electronic systems, telecommunications, and computer science—key disciplines in modern railway signaling. Since 2022, trainers from SYSTRA Academy have been providing courses to CNAM’s apprentices specializing in Railway Signalling. SYSTRA Academy is involved throughout the 3 years of the training programme.

The curriculum also integrates crucial human skills and socio-economic insights, ensuring that engineers are well-prepared to contribute effectively to the successful development of industrial projects within the railway sector. They also practice English language for international work purpose. In the scope of STAFFER Task 6.6, the Development and Innovation in Transport Systems (DITS) at Università degli Studi di Roma La Sapienza (Uniroma1) organised an international mobility programme during the summer of 2023 for 17 Cnam’s apprentices in Railway Signalling Engineering, accompanied by 2 professors. Seven apprentices, and one professor, participated in the summer school organised by Uniroma1 in July 2024.

In the scope of the STAFFER project and in order to meet the market's employment needs, Cnam will emphasise the development of new EQF 3-5 training programmes, as outlined below. Although Cnam initially did not offer training programmes in the railway sector at these levels, its involvement in the STAFFER project has created an opportunity to expand its presence in the railway-training field.

6.3 Regulatory Framework and Procedures for Implementing Training Programmes at Cnam

At Cnam, training programs must be accredited by the French Ministry of Higher Education following a thorough evaluation by HCERES (Haut Conseil de l'évaluation de la recherche et de l'enseignement supérieur - High Council for the Evaluation of Research and Higher Education). In France, HCERES plays a critical role in evaluating, accrediting, and ensuring the quality of higher education institutions and research organizations. Its main responsibilities include evaluating institutions, analysing programmes prior to ministry accreditation, accrediting programmes, monitoring quality assurance, and providing expertise to institutions and policymakers. Each training programme must complete a four-phase process that may last a minimum of two years before it can be implemented:



- **Diploma creation file:** A diploma creation file must be submitted to the EPN03 council. The council members will closely examine the interest of creating such a diploma and will give their opinion on whether to proceed with the creation. The EPN council meets 4 times a year.
- **Validation by the Training Council:** Once approved by the EPN council, a more comprehensive file will be presented to the Training Council. In this file, the authors must justify and defend their choices. This Training Council meets 10 times a year.
- **Submission to the HCERES:** Once approval is granted by the Scientific Training Council, the final and most challenging step is to submit the complete file for evaluation by HCERES. Following this process, the French Ministry of Higher Education will grant accreditation to the certification for a specified duration, typically up to five years.
- **Filling and submitting a RNCP file (Répertoire National des Certifications Professionnelles - National Directory of Professional Certifications file) to France Compétence:** France Compétence is the French national agency responsible for managing the National Directory of Professional Certifications. It plays a crucial role in the French education and vocational training system by overseeing the certification and validation of qualifications and competencies acquired through formal education, work experience, or other non-formal learning pathways.

The last two phases are highly managed by the DNF (Direction National des Formations - National Directorate of Trainings) of Cnam. The DNF is a functional department that manages Cnam's training offer (LMD degrees, institutional degrees, RNCP certifications, master's degrees, engineering degrees, etc.) at national level, including its accreditation and deployment across CNAM's network.

In the submitted files, the following information should be highlighted: certification identification, objectives and context of the certification, targeted activities, certified transversal and specific skills, assessment methods, sectors of activity, types of accessible jobs, skills validation, organization of teaching, orientation support systems, international openness, pedagogical adaptation to new technologies, training management, professional insertion of apprentices, and the partnerships established. The files should be supported by several letters of endorsement from industry and sector stakeholders. Once received, the file generally needs 7 months to be evaluated by France Compétence.



6.4 Diagnosis of skills and training needs in the railway transport sector

France 2030 is an ambitious strategic plan set forth by the French government to propel the nation towards a resilient, sustainable, and innovative future. At the heart of France 2030 lies a commitment to transforming key strategic sectors. Embracing green technologies is one of the cornerstones, with significant investments directed towards clean energy, electric mobility, and climate-resilient infrastructure. Furthermore, France 2030 emphasises the deployment of hydrogen technology, digitalization, and the decarbonization of mobility. The use of battery storage systems is also prioritised to achieve comprehensive objectives related to future sustainability and energy transition.

In this context, the identification of 17 occupations already under strain highlights a shortage of available skills and associated profiles in the short term, with these occupations facing competition from various industrial sectors. The profiles in high demand largely involve technicians and senior technicians in the fields of electromechanics, power electronics, assembly, works operation, maintenance, testing, and electrical work ... These profiles are directly related to EQF levels 3-5.

The rail's workforce demographic is characterised by an aging pyramid, with a notable gender disparity – 80% of employees are men and only 20% are women. Approximately one in five employees is over the age of 50.

According to the latest diagnostics conducted by UTP (Union of Public and Rail Transports) in May 2023, the passenger rail transport sector expects to recruit an estimated 2,000 to 3,900 new employees annually across all professions from now until 2030. Among these:

- Train driving roles will see between 200 and 430 new hires per year.
- Sales and control positions will account for approximately 400 to 770 recruitments annually.
- Network access and circulation positions are projected to fill between 360 and 730 new roles each year.
- Equipment maintenance roles will have an annual intake ranging from 300 to 590 new hires.

The recruitment drive aims to replace retiring employees, with 17% of the workforce expected to retire between 2021 and 2030. Additionally, approximately 2.5% of employees leave the sector annually for other reasons.

These figures underscore the sector's strategic approach to addressing recruitment needs and maintaining operational excellence amidst evolving demographic and training challenges.

French national context

In France, on a national level, short lines make up 42% of the total rail network, i.e. 12632 km, of which only 18.5% are electrified. Because of their low ridership, some of these lines could have an excessive high GHG emission rate per km and per passenger. The National Low-Carbon Strategy aims to reduce GHG emissions by 40% by 2030 compared with 1990 levels, and to achieve carbon neutrality by 2050. In line with this strategy, a complete phase-out of diesel by 2030 was announced, involving the retirement of 1079 diesel and 1691 dual-mode self-propelled trains. Given the cost of electrification, which can vary from 0.7 to 3 million euros per km, and depending on the local context of each line, two solutions can be envisaged: partial electrification with battery-powered traction units, or the use of hydrogen-powered trains.

According to what has been mentioned, studies shows that there's a pressing need for skills in:

- **Alternative Propulsion Systems:** including expertise in H₂ propulsion and onboard battery energy storage system maintenance.
- **Electrical Traction and Power Conversion:** requiring skills in maintenance and operation to support electrification efforts and ensure efficient power transmission.
- **Energy Management:** encompassing facilities management and driving practices.

6.5 Transformeurs Project

As previously mentioned, before STAFFER project, CNAM has already an engineering degree in Railway Signalling, EQF level 7, accredited by the Commission des Titres d'Ingénieurs (Engineering Qualifications Commission). Under the auspices of the HESAM University, CNAM established fruitful collaboration with the French Union of Public and Rail Transports (UTP). Several meetings were held with UTP representatives to implement STAFFER findings on a national scale aimed at encompassing major aspects of urban transport (Bus, Tram, Metro, and Train).

As a fully active partner, CNAM participated in the Call for Expression of Interest - Future Skills and Jobs project (AMI – CMA: Appel à Manifestation d'Intérêts – Compétences et Métiers d'Avenir), led by the UTP, known as Transformeurs. The aim is to foster innovation, training, and employment within the urban transportation and railway sectors, which are considered strategic for future economic and social development. The Transformeurs project was officially accepted

in June 2024, and it will enable CNAM to collaborate with 17 other partners to develop training programmes scheduled for implementation in 2025-2026.

As part of the STAFFER implementation and based on WP4 findings, the training needs analysis, and the description of the national French context outlined above, CNAM has proposed the implementation of three new training programmes at EQF levels 4 and 5, alongside the adaptation of three existing bachelor's programmes at EQF level 6. The EQF level 4 and 5 training programmes primarily target train drivers, railway maintenance, and train power supply maintenance. The EQF level 6 programmes focus on operations, signalling, and energy storage systems.

The Transformeurs project will allow CNAM to secure funding for equipping laboratories with the latest technology, developing pedagogical engineering process, establishing local partnerships, financing marketing efforts to improve attractiveness, and supporting mobility activities between CNAM's regional centers.

6.6 CoVERED Initiative

The co-leading of WP6 and the leading of Task WP6.5 of the STAFFER project encouraged CNAM to invest more in EQF level 3-5 training programmes. Indeed, in light of the various research and analyses conducted, many challenging issues have been highlighted.

The mobility ecosystem faces a significant social challenge, primarily concerning the extensive adjustments demanded of companies in terms of job transformation and the adoption of green and digital transitions. Moreover, the sector faces an ageing workforce, as approximately 30% of employees are expected to retire within the next decade resulting in the loss of traditional knowledge of the rail system. This demographic shift could potentially result in job shortages and impact businesses, particularly SMEs, necessitating tailored support measures. Furthermore, the rail sector struggles with attracting young engineers and skilled workforce. Consequently, strategic approaches are needed, particularly concerning upskilling, reskilling, accommodating sector and career changers (lateral entries), and recruiting staff with migration backgrounds from both within and outside Europe. Additionally, women are underrepresented, constituting only about 20% of the railway workforce and much less in technical occupational profiles. The sector faces also a shift in occupational profiles driven by macroscopic trends such as digitalisation and automation. This change necessitates the acquisition of new technical and social skills and competences to adapt to the evolving demands of the industry. Acknowledging and addressing these challenges is paramount to strengthening the resilience of the railway sector. By recognising obstacles and proactively overcoming them, the industry can adapt to

evolving demands and ensure its long-term viability. By embracing sustainability initiatives and reducing environmental impact, the railway sector can contribute to broader EU goals while enhancing its own resilience.

Overcoming social barriers and cultural attitudes toward vocational training and lifelong learning is crucial to cultivating an engaged and competent workforce, with opportunities and support necessary for developing and acquiring new skills and techniques in both upskilling and reskilling activities.

Creating partnerships with the railway sector would greatly improve vocational education and training (VET) providers' access to new technologies. By incorporating these technologies into their curricula and adopting their learning methods and techniques, VET institutions can effectively impart relevant skills to the incoming workforce and facilitate the retraining of new entrants.

Continuous market monitoring, identification of current gaps, and anticipation of future needs are critical steps in developing agile training strategies for attracting more talents by the rail sector. These initiatives are essential for ensuring that VET providers are equipped to meet the industry's evolving demands through effective training and education programmes.

The ongoing technological transformation is driven by key policy initiatives such as the European Green Deal and the European Digital Decade. The European Commission has outlined a comprehensive plan for sustainable and smart mobility in its Sustainable and Smart Mobility Strategy, which includes an Action Plan comprising 82 initiatives. These initiatives aim to achieve a 90% reduction in emissions by 2050 within the transport sector. The strategy prioritises the adoption of zero-emission vehicles, the expansion of high-speed rail networks, the advancement of automated mobility solutions, and the integration of zero-emission marine vessels by 2030.

Based on these findings and in strong collaboration with 13 STAFFER partners (Cnam, CESI, UNIGE, Uniroma1, For.Fer Srl, Hitachi Rail, DB, TUD, UASFH, wmp Consult, MAFEX, AUTH, and CTU), CNAM submitted an ERASMUS+ KEY ACTION 2 project proposal - Call for Centers of Vocational Excellence, titled CoVERED (Centre of Vocational Excellence for Railway Empowerment and Development). The project assembles a consortium of 25 partners and was submitted on May 7, 2024. The objective of the CoVERED project is to establish a network of Centres of Vocational Excellence (CoVEs) dedicated to empowering and developing skills in the railway sector, mainly at EQF Levels 3-5. The project aims to achieve the following specific objectives:



- **Skills Development:** Enhance the quality and relevance of vocational education and training (VET) programmes in the railway sector to meet the evolving needs of the industry. This includes developing innovative curricula, delivering professional development programmes, and promoting lifelong learning opportunities for railway professionals.
- **Promote Innovation:** Foster innovation in railway education and training by leveraging state-of-the-art technologies, methodologies, and teaching practices. The project seeks to promote the co-creation of knowledge, experimentation, and research within practice communities to drive continuous improvement and innovation.
- **Facilitate Mobility:** Establish a European railway mobility framework to facilitate student and staff exchanges, foster collaboration among educational institutions and industry partners, and promote cross-border learning experiences. By facilitating mobility, the project aims to enrich the learning environment, promote cultural exchange, and enhance skills development.
- **Enhance Attractiveness:** Improve the attractiveness of vocational education and training programmes in the railway sector to attract a diverse range of learners and talent. This includes developing promotional campaigns, offering career guidance and support services, and highlighting the career prospects and opportunities available within the railway industry.

6.7 Cnam's Training Programmes

6.7.1 Professional Specialization Diploma (DSP)

At EQF level 3-5, CNAM decided to implement two types of training programmes, DSP and DEUST, who should pass the 4 phases-process mentioned above.

The Diplôme de Spécialisation Professionnelle (DSP - Professional Specialization Diploma) is a certification registered at EQF level 4 by France Compétence. This diploma is designed with a focus on professional integration and is defined in collaboration with professional and associative stakeholders, as well as public administrations. It also allows for further studies in the second year of higher education (the programme grants 60 European Credits Transfer System - ECTS). The training includes a core curriculum that provides general education and specialised teaching units corresponding to a professional path organised in a sector or professional branch. It incorporates a period of professional training to acquire specific technical and professional skills. This period is the subject of a report evaluated by the teaching team.

The DSP is a one-year post-baccalaureate programme accessible via the Parcoursup training search engine. This Bac+1 programme offers high school graduates who wish to specialise in a



professional field a one-year university education. These programmes are primarily designed with a goal of professional integration. They also allow for continuation of studies in the chosen professional field in the second year of a first-cycle higher education programme, as the validation of the DSP is awarded with 60 ECTS. All DSP programmes are co-developed with local professional or associative actors or public administration representatives who participate in the training. The DSP programmes developed by CNAM are prepared through apprenticeships.

The DSP allows students to:

- Discover a professional sector;
- Acquire specific knowledge and skills related to the concerned professional sector;
- Become concretely familiar with the professions and contexts in which they are practiced;
- Facilitate their employability in the concerned sector of activities.

6.7.2 Diploma of University Studies in Science and Technology (DEUST)

The other type of training diploma is the DEUST (Diplômes d'Etudes Universitaires Scientifiques et Techniques - Diploma of University Studies in Science and Technology), which admits high school graduates who wish to pursue short-term studies at the university. DEUST degrees are prepared over 2 years after high school and aim for direct professional insertion.

Like the DSP, applications for DEUST are managed through the national pre-registration platform for the first year of higher education, Parcoursup. This EQF level 5 professional certification diploma is validated by 120 ECTS, which are capitalizable, meaning they are permanently acquired regardless of the length of the study path. This allows for an interruption and then a resumption of studies.

6.7.3 DSP in “Electric Battery Construction and Maintenance Operator”

In France, non-electrified rail lines account for approximately 48% of the total railway network. Most of these lines are considered "small lines," branch lines, local lines, or secondary lines. These lines are generally underutilised and infrequently traveled, and are mainly served by diesel trains, resulting in CO₂ emissions in grams per passenger-km (g/passenger.km) that are considerably high. According to the national carbon neutrality strategy, these trains will soon need to be replaced by electrified trains, hydrogen trains, battery trains, or hybrid trains, depending on geographic and economic constraints. In all cases, a battery storage system will need to be integrated into the train.

To address the growing demand for industrial maintenance technicians specializing in electric batteries in the electromobility sector, Cnam submitted a request for a Diplôme de Spécialisation Professionnelle (DSP) for "Electric Battery Construction and Maintenance Operator" to France Compétence as part of the École de la Batterie (France 2030 project). Cnam received a favorable response, and this programme will be available at CNAM Auvergne-Rhône-Alpes regional center, specifically at its Grenoble branch, in October 2024. This training programme is conducted in partnership with the company VERKOR, which is currently constructing a gigafactory in the region.

The EQF level 4 programme has two objectives: to support young people seeking immediately operational and professional training and to retrain more mature individuals seeking employment. It will meet the increasing need for battery maintenance technicians in train maintenance workshops as well as the hundreds of positions available in battery factories that will soon be built in France and across Europe. The diploma is accessible to any student with a high school diploma (general, technological, or vocational) and to any professional with experience in the electrical field (whether currently employed or seeking job reorientation).

While this profession is primarily exercised in the maintenance of batteries for future transportation means, it is also valuable to all industrial sectors related to stationary electric energy storage. The programme description details can be found in Annex 1.4.1.

6.7.4 DSP Public Transport Driver

This new DSP will have one common core and at least three specialization tracks (tram, metro, and train). The pedagogical engineering process for the creation of this new DSP is set to start in November 2024. To reduce the carbon footprint, public transport drivers (tram, metro, and train) play a crucial role. The driver's profession is undergoing significant evolution. By 2025, in the railway sector, energy consumption for traction could decrease by 20% if eco-driving and eco-parking practices are well understood and applied. Considering various parameters (speed, train position, track profile, etc.), the driver will learn to meet arrival schedules while consuming the least amount of energy possible.

Thanks to newly acquired skills, reducing energy costs, decreasing the stress on traction motors (leading to reduced maintenance), and achieving smoother driving through consistent speed will be essential points for decarbonizing rail transport. Learners will gain solid knowledge in electricity, mechanics, traffic regulations, and safety procedures to ensure the required level of safety and reliability on board and within rail premises.

This EQF level 4 programme, part of an apprenticeship curriculum, is intended to be developed and implemented in close collaboration with national partners.

6.7.5 DSP in Railway Maintenance

Initially, Cnam proposed to develop a DSP in “Urban and Territorial Railway Safety Operator.” The pedagogical engineering process for creating this new DSP is set to start in November 2024. However, national Transfomeurs’s partners preferred to develop a DSP in Railway Maintenance due to the strong recruitment pressure for this type of position. Faced with increasingly critical challenges regarding the availability and reliability of equipment, the development of predictive maintenance has emerged as an indispensable solution to better control the condition of trains and infrastructure. Ultimately, predictive maintenance allows for the elimination of periodic checks, a 20% reduction in maintenance costs, and a 30% decrease in the number of maneuvers performed.

6.7.6 DEUST in Maintenance of Electrical Systems for Urban Transport

The emerging context of future urban transport, focused on electrification and sustainable mobility, requires highly skilled professionals. In this perspective, the Diploma of University Studies in Science and Technology (DEUST) in Maintenance of Electrical Systems for Urban Transport has been introduced. This EQF level 5 programme aims to meet the growing demand for technical expertise in the maintenance of power supply and conversion systems.

The senior technician in maintenance of power supply and conversion systems for future urban transport must possess up-to-date knowledge covering the entire chain of power transfer and conversion, which will predominantly be electrical in the near future. Whether the energy source originates from rails, power lines, or integrated storage devices such as batteries and fuel cells, a variety of conversion methods is required. In this constantly evolving context, the new Bac+2 level DEUST is emerging as a fundamental pillar by ensuring the training of senior technicians with in-depth expertise in the maintenance of various electrotechnical components. These components perform crucial functions such as energy sourcing, conversion, protection, transmission, and traction, and contribute to the formation of the electromechanical transmission system within transport means.

Thus, this programme aims to equip learners with the necessary skills to tackle the complex and specific challenges related to the maintenance of power supply and conversion systems in the context of future transport means. By acquiring a thorough mastery of emerging technologies and advanced maintenance protocols, DEUST graduates will be empowered to ensure the reliability, safety, and performance of these essential systems for sustainable urban mobility.

The EPN03 pedagogical team at Cnam initiated the development of a DEUST in Electronics, Electrical Energy, and Automation. Following the outcomes of STAFFER WP4, Cnam proposed integrating a specialization within the DEUST.

This DEUST programme will offer three tracks:

- Track 1: Electrical Engineering and Industrial Computing (GEII)
- Track 2: Maintenance of Electrical Systems for Urban Transport (MSET)
- Track 3: Nuclear Environment (EN)

The application was submitted to France Compétence and the Training Evaluation Department of HCERES during the 2023-2024 Evaluation Campaign. Approval for its establishment was granted in June 2024, and the DEUST has since been accredited and approved

Since November 2024, the team will work on:

- **Collaborate with rail stakeholders interested on finalizing courses contents.**
- **Implementation planning:**
 - Developing the programme implementation schedule,
 - Allocating necessary resources (teaching staff, infrastructure, budget),
 - Selecting centers where the programme will be deployed.
- **Recruitment and training:**
 - Hiring necessary teaching and administrative staff,
 - Training staff on the new programme and its specifics.

Official launch of the programme on the Parcoursup platform starting in early January 2025 to enable students to select the programme. The training is scheduled to commence in September-October 2025. The content of the DEUST in Electronics, Electrical Energy, and Automation, specialization in Maintenance of Electrical Systems for Urban Transport (MSET), is detailed in Annex 1.4.2.

6.8 Training course on High-Speed Train Braking System

6.8.1 Overview

As part of the STAFFER project, Cnam has created two courses with the common goal of training students to understand the operation of a train braking system. The first course, at EQF level 3, aims to provide the necessary physical principles to tackle the second course, at EQF level 4, which specifically covers the fundamentals of the TGV braking system. This provides learners with a deep understanding of high-speed train braking systems, preparing them for careers in train maintenance with specialised expertise in this critical area.

The courses are designed to provide comprehensive training in the testing and maintenance of TGV brakes. They aim to equip learners with a deep understanding of the entire braking system, from the production of pneumatic energy to the actuation of braking cylinders, ensuring that each component's operational role within its environment is thoroughly understood.

The contents consist of detailed PowerPoint presentations based on courses in electro-pneumatics and enriched by solid practical insights explaining the operation of the braking system components clearly.

One of the primary objectives of the course is to familiarise learners on electro-pneumatic braking circuits.

The courses will be incorporated into the future DSP in Railway Maintenance and the DEUST in Maintenance of Electrical Systems for Urban Transport training programme, which will be developed and implemented at Cnam.

6.8.2 Applied Physics for Railway Systems

The objective of this course is to provide learners at EQF level 3, who aspire to work in train maintenance, with essential knowledge of the laws of physics in electricity, mechanics, and pneumatics. By acquiring this knowledge, they will gain a better understanding of the basic functioning of the pneumatic, electrical, and mechanical systems used in trains.

The training program encompasses several key areas; general electricity, general mechanics, and general pneumatics.

Learners will receive comprehensive training in electricity, covering fundamental concepts and electrical metrology. The course will also emphasise electrical safety rules, ensuring that students understand how to work safely with electrical systems. The course includes, also, general training in mechanics, focusing on essential principles and practical applications. Learners will study fasteners and mechanical metrology, providing them with the skills to handle mechanical components and measure mechanical properties accurately. Learners will, then, explore basic pneumatics laws, understanding the principles of air production and the operation of air conditioning units. The course covers the functioning of cylinders and distributors, as well as the interpretation of marking elements in pneumatic diagrams. The table of contents of the course could be found in ANNEX 3.3.

6.8.3 High-Speed Train Braking System: Fundamentals and Maintenance Applications

The objective of this course is to equip EQF level 4 learners, who aspire to work in train maintenance, with essential knowledge about the operation of high-speed train braking systems. This course delves into the various power and control components that constitute the braking

system of a high-speed train. Learners will be introduced to the rolling stock of high-speed trains, gaining an understanding of the types and functionalities of different train units. They will also learn about the numbering system for train units, providing insight into how units are identified and classified. The course covers the different levels of maintenance intervention, from routine checks to more extensive repairs, and provides an overview of the common units found in high-speed trains, their roles, and how they interact within the train system.

In exploring the braking system, students will begin with an introductory overview, setting the stage for more detailed exploration. They will gain knowledge about electric braking, understanding how electrical systems are used. The course also covers pneumatic braking, explaining the basic function of pneumatic braking and how air pressure is used to apply the brakes.

Learners will investigate the braking control devices in the driver's cab, with a focus on the operation and importance of the driver's brake valve. The course will cover the electropneumatic brake system, which combines electrical and pneumatic technologies for enhanced braking control. There will be an exploration of the braking mechanisms specific to motor bogies, the powered wheelsets of the train, and an examination of the coordination required between different braking systems to ensure effective stopping.

Students will gain a detailed understanding of the emergency braking system, its activation, and how it ensures the safety of the train and passengers. They will also learn about the braking systems used in trailer bogies, the unpowered wheelsets of the train, and the operation and importance of the parking brake in securing the train when stationary. The course will conclude with an overview of the holding brake used during brake testing procedures to ensure proper functionality. The table of contents of the course could be found in ANNEX 3.4.

7 CONCLUSION

The STAFFER project has made significant progress in establishing a skills alliance within the European rail sector. Task 6.5 specifically targeted the implementation of training programmes at EQF levels 3 to 5.

Among the 31 STAFFER partners, three were actively engaged in delivering training at these levels:

- **For.Fer Srl**, an Italian professional railway VET training center, operates in compliance with ANSF Decree No. 4 of August 9, 2012, and is recognised by ANSFISA.

- **HTL Mödling and HTL Rennweg**, two Austrian higher institutes, offer general education rather than specialised railway training and must adhere to Austrian Federal Law Gazette II.

Given the significant demand for skilled workers with EQF levels 3-5 training in the French railway sector, labeled under “high-pressure profiles”, **CNAM**, in collaboration with 13 STAFFER partners, has submitted an ERASMUS+ KEY ACTION 2 project under the Call for Centers of Vocational Excellence. The project, titled CoVERED (Centre of Vocational Excellence for Railway Empowerment and Development), aims to develop rail-specific training programmes at EQF levels 3-5.

This deliverable begins with an overview of the crucial findings from Work Package 4, highlighting the specific educational needs and skill requirements within the rail sector. The report then moves on to explain the evaluation methodology, emphasizing the use of comprehensive questionnaires to assess the effectiveness of the pilot programmes. It offers also details on the various training programmes implemented. Additionally, the deliverable includes an evaluation of these pilot programmes, focusing on participant satisfaction, learning outcomes, and providing recommendations for future improvements.

In conclusion, training programmes must adhere to industry standards, regulatory requirements, and national education laws, necessitating collaboration among educational institutions, railway industry participants, policy organizations, and ministries to refine the accreditation process. As technology advances rapidly, training programmes must evolve to stay relevant and synchronised. Embracing modern technologies can significantly improve training effectiveness and engagement. Additionally, planning for long-term impact involves developing strategies for the sustainability and expansion of training initiatives. Moving forward, aligning accreditation processes dynamics with technological advancements and workforce requirements will necessitate strengthened collaboration among railway stakeholders, including funding agencies that support such collaborative efforts.