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Ministry of Physical Infrastructure and Transport

Department of Transport Management

NEPAL INDIA REGIONAL TRADE AND TRANSPORT PROJECT (NIRTTP)

SUB-PROJECT OFFICE

Road Transport Safety and Axle Load Control Study in Nepal

Part B: Axle Load Control

Task - B4

VEHICLE OVERLOADING CONTROL GUIDELINES

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ACROYNMS AND DISAMBIGUATION

ALC-MS	: Axle Load Control Management System
BLT	: Build Operate Transfer
BOOT	: Build Own Operate Transfer
BOT	: Build Operate Transfer
BS EN ISO	:British Standards in English language International Standards Organization
BTO	: Build Transfer Operate
CSV	: Comma (,) Separated Values
DoR	: Department of Roads
DoTM	: Department of Transport Management
ESA	: Equivalent Standard Axle
ESAL	: Equivalent Standard Axle Load
FTTEN	: Federation of Truck Transport Entrepreneurs Nepal
GVW	: Gross Vehicle Weight
HSWM	: High Speed Weigh-in-Motion
ICD	: Inland Container Depot
LPG	: Liquid Petroleum Gas
LSWM	: Low Speed Weigh-in-Motion
MS	: Microsoft
PDF	: Portable Data Format
ROO	: Rehabilitate Own Operate
ROT	: Rehabilitate Operate Transfer
SEZ	: Special Economic Zone
SN	: Serial Number
UK	: United Kingdom
WIM	: Weigh in Motion

EXECUTIVE SUMMARY

Vehicle overloading control is a challenging task from its planning to operation and management because it has to be addressed a number of issues of the different disciplines such as legal provisions, electronic system, computer system, mechanical system, traffic signaling system, facility management, human resource management, financing, operation of weighbridges, and maintenance management. Therefore, a standard guidelines is necessary for planning, operation and monitoring of weighbridges to control the vehicle overloading. These guidelines are to be used by the Department of Transport Management (DoTM) in particular and other stakeholders in general for an endeavor to control the overloading in the freight vehicles considering the freight traffic originated both within the country and cross-border running inside the country.

The main scopes and objectives of these guidelines are to guide DoTM officials in selection of weighbridge type, selection of installation location, selection of physical facilities, data analysis and reporting, financing mechanism, operation and monitoring of weighbridge, capacity enhancement of DoTM officials, and depict the possibility of using the existing weighbridges.

On the selection and installation of weighbridges, various types of available weighbridges and weighing methods are discussed. As for weighbridge types, basically there are fixed and portable (movable) types of weighbridges. In the fixed type, there are single axle, axle unit and multi deck weighbridges, and that for movable types single axle weighbridge is used in general because frequent transportation of axle unit and multi deck weighbridges are not so convenient. As for weighing method, there are two types, namely static and dynamic. For the dynamic weighing method, Weigh-In-Motion (WIM) is becoming more popular in the recent days. In WIM, vehicles are screened in two phases in High Speed Weigh-In-Motion (HSWIM) and Low Speed Weigh–In-Motion (LSWIM). If vehicle is suspected to vehicle overloading in LSWIM, the vehicle is directed to HSWIM automatically by the system. Further, if HSWIM detects the vehicle is overloaded, the vehicle is directed to static weighing for precise measurement and potential penalties.

Criteria related to the selection of weighbridge locations are discussed. For the selection of weighbridge installation location factors such as controlling the overloads at the freight origins, border check points, Inland Container Depots (ICDs), industrial zones and special economic zones (SEZs) and mega project sites are to be considered. The typical weighbridge layouts both for static and WIM weighing are also presented.

As far as data collection analysis and reporting is concerned, it is the responsibility of DoTM. The type of data shall be clearly defined and there should always be consistency in data to be collected from various weighbridges. The data to be collected should cover various aspects such as administrative details, weighing details, vehicle overloading and fining details etc. It is presumed that DoTM will install Axle Load Control Management Information System (ALC-MIS) and data collection; analysis, reporting and sharing functions are to be compatible with the ALC-MIS.

As for financing mechanism, both public and private sector are considered. The involvement of private sectors could be in the form of service contract, management contract, lease contract concession, and full privatization. The merit and demerit of each financing mechanism are presented. There are a number of risks while involving the private sector in vehicle overloading control and these risks include services not meeting the required standards, counterparty, force majeure, operation, regulatory and technology risks. However, these risks can be mitigated through drafting a comprehensive contract.

For the operation of weighbridges, fully dedicated trained human resources equipped with proper guidelines and manuals are required together with weighbridges installed with proper verifications and calibrations. A comprehensive training course for the DoTM personnel involved in axle load control and enforcing agency, the traffic police, has been drafted and presented as eight training courses on various topics. The operation hours of weighbridge should be 24 hours and 365 days probably in shift basis. In this endeavor, there should always be good coordination and cooperation among the stakeholders like DoTM, traffic police, truck operators and private sectors.

मुख्य-संक्षेप

सवारी साधनहरुको अत्याधिक भार वहन गर्ने समस्यालाई ृनियमन गर्न चुनौतीपूर्ण रहेको छ, किन भने यस सँग सम्वन्धित विभिन्न निकाय ऐन, विद्युतिय सुचना प्रणाली, मेकानिक, ट्राफिक संकेत प्रणाली, पूर्वाधार, मानव स्रोत, आर्थिक पक्ष, तौलपुल र यसको संचालन र व्यवस्थापन आदि पक्षहरु रहेका हुन्छन । यसैकारण, सवारी साधनहरुको अत्याधिक भार वहन नियमन, गर्न प्रयोग हुने भार मापन केन्द्र या तौलपुलहरु संचालन गर्न विशिष्ट प्रकारको संचालन कार्यविधिको आवश्यकता रहेको हुन्छ । यो कार्यविधि, विशेषतः यातायात व्यवस्था विभागले र सामान्यतः अन्य सरोकारवाला निकायहरुले उपयोग गरी, अन्तरदेशीय र स्वदेश भित्र संचालन हुने मालवाहक सवारी साधनहरुको अत्याधिक भार नियन्त्रण गर्न सहयोगी हुने छ ।

यस कार्यविधिको प्रमुख उद्देश्य र कार्य क्षेत्र भनेको यातायात व्यवस्था विभागलाई सवारी भार मापन केन्द्रका तौलपुलहरुको संचालन गर्न, यस्ता तौलपुलहरुको प्रकार छनोट, स्थान छनोट, अन्य आवश्यक पूर्वाधारहरु, तथ्याङ्क विश्लेषण र रिपोर्टिङ्ग, आर्थिक पक्ष, संचालन र अनुगमन, विभागका कर्मचारीको क्षमता विकास साथै हाल संचालनमा आएका तौलपुलहरुलाई पनि यस प्रणाली भित्र ल्याउन सकिने सम्भावनाका अध्ययन समेत यस कार्यविधिमा समावेश गरिएको छ ।

तौलपुलहरुको छनोट र संचालन गर्न, विभिन्न प्रकारका तौलपुलहरुको वारेमा चर्चा गरिएको छ । तौलपुलको प्रकारहरुमा सामान्यतः स्थायी जडान हुने प्रकार (Fixed Type) र स्थानान्तर गर्न सकिने (Portable Type) गरी २ प्रकारको उपलव्ध छन‍ । स्थायी जडान हुने प्रकारमा एकल एक्सल या वहु एक्सल प्रकारको तौलपुल उपलव्ध छन‍ भने स्थानान्तर गर्न सकिने प्रकारमा एकल एक्सल तौलपुल उपलव्ध छन । सवारी गुडिरहेको अवस्था पनि तौल मापन गर्न सकिने प्रणाली (Weight-In-Motion WIM) हाल केहि देशहरुमा प्रचलनमा आइसकेका छन ।

यस WIM प्रणालीमा सवारीको गति अनुसार उच्च गति WIM (HSWIM) र कम गतिमा WIM (LSWIM) गरि दुई प्रकारको प्रणाली छन‍। यदि सवारी साधनले अत्याधिक भार वहन गरेको आशंका भएमा र LSWIM ले पनि वढि भार वोकेको देखाइएमा त्यस्ता सवारी साधनलाई स्वचालित रुपमा जडित तौलपुलमा लगि सवारीको तौल मापन गरिने प्रणाली रहेका हुन्छ ।

यस कार्यविधिमा, तौलपुलहरु जडान गर्ने उपयुक्त स्थान छनोट गर्ने तरिका सम्वन्धि पनि जानकारी गराइएको छ । यी स्थानहरु पहिचान गर्न, मालसामान लोड हुने स्थान, सामान चेक पोष्ट, Inland Container Depots (ICDs), औधोगिक क्षेत्र र विशेष आर्थिक क्षेत्र र ठुला आयोजना स्थल आदिलाई ध्यानमा दिनु पर्ने उल्लेख गरिएको छ । दुवै प्रकारको तौलपुलहरुको प्रारम्भिक नमुना डिजाइन पनि यसै साथ संलग्न गरिएको छ ।

तौलपुलबाट प्राप्त तथा तथाङ्कहरुको विश्लेषण गर्ने निकाय यातायात व्यवस्था विभाग हो । कुन कुन प्रकारको तथ्याङ्क संकलन गर्ने र सवै तौलपुलहरुबाट एउटै प्रकारको तथ्याङ्क संकलन गरी एकरुपता ल्याउन पनि आवश्यक हुन्छ । संकलन गरिएको तथ्याङ्कमा स्थान, तौल र अधिक तौल र जरिवाना आदिको विवरण हुने छ । यातायात व्यवस्था विभागले निकट भविश्यमा भारवहन नियन्त्रण सुचना व्यवस्था प्रणाली (Axle Load Control Management Information System, ALC-MIS) को संचालनमा ल्याउने छ र सवारी साधनहरुको तथ्याङ्क पनि यही प्रणालीलाई आवश्यक पर्ने गरी संकलन गरिने छ ।

यस प्रणाली संचालनको लागी आवश्यक पर्ने आर्थिक श्रोतको लागी सरकारी तथा निजी क्षेत्रको सहभागीतामा सेवा करार, व्यवस्था करार, लिज करार र पूर्ण निजीकरण आदि रहन सक्ने छ । सरकारी र निजी लगानीका फाइदा र वेफाइदाको वारेमा पनि चर्चा गरिएको छ । निजी क्षेत्रलाई समावेश गर्दा हुन सक्ने जोखिमहरुमा अपेक्षित स्तर कायम

गर्न नसक्ने, व्यवस्थापन र संचालनमा कमजोरी आदि हुन सक्छन तर यी कमजोरीलाई सच्याउन उपयुक्त करारनामाको मस्यौदा गर्नुपर्ने हुन्छ ।

तौलपुलहरुका संचालनको लागि दक्ष जनशक्तिको आवश्यकता र साथै संचालन कार्यविधिहरु, सरसामान र सहि रुपमा तौल निर्धारण (Calibration) को आवश्यकता रहन्छ । यसका लागि यातायात व्यवस्था विभागका कर्मचारी, ट्राफिक प्रहरीलाई आवश्यक पर्ने तालिमको नमुना पनि यसै साथ समावेश गरिएको छ । तौलपुलहरुको संचालन दिनको २४ सै घण्टा र वर्षको ३६५ दिन नै संचालन गर्नु पर्ने भएकोले विभिन्न सरोकारवाला निकायहरु जस्तै यातायात व्यवस्था विभाग, ट्राफिक प्रहरी ट्रक व्यवसायी र अन्य निजि क्षेत्रका निकायहरु सँग वलियो संमन्वयको ठुलो महत्व र भुमिका रहेको हुन्छ ।

CHAPTER 1 INTRODUCTION

1.1 BACKGROUND

Vehicle overloading control is a challenging task from its planning to operation and management because it has to be addressed a number of issues of the different disciplines such as legal provisions, electronic system, computer system, mechanical system, traffic signaling system, facility management, human resource management, financing, operation of weighbridges, and maintenance management. Vehicle overloading control guidelines in developing countries like Nepal are further important in planning, operation, and monitoring of weighbridge stations because there are number of constraints such as legal provisions, responsibility assignment among the stakeholders, physical resources, human resources and financial resources. Therefore, a comprehensive guideline that cover most of prominent issues is necessary to avoid the confusions and anomalies associated with the planning, operation and management of weighbridges. This guideline has made an earnest attempt to make as simple as possible for assuring the consistency in the vehicle weighing for the purposes of controlling vehicle overloading.

1.2 SCOPE AND OBJECTIVE

The scope and objectives of this guideline associated with the control of vehicle overloading as set forth in the TOR are as follows:

i. Standard requirement and operation and monitoring guidelines for the private weighbridges that are used for overloading control;
ii. Guidelines for selecting the appropriate location of overloading control station including the minimum requirements for the physical facilities and management;
iii. Selection, installation and operation of planned weighbridge stations by the private and public sector;
iv. Management of weighbridge data collection, analysis, and reporting including the cross border freight;
v. Training manuals and materials for persons working on the operation, monitoring, and control of weighbridge personnel.

1.3 DEFINITION

Axle: The common axis of rotation of one or more wheels, whether power driven or freely rotating, and whether in one or more segments and regardless of the number of wheels carried thereon.

Axle Load: The axle load of a wheeled vehicle is the total weight felt by the roadway for all wheels connected to a given axle. Viewed another way, it is the fraction of total vehicle weight resting on a given axle. Axle load is an important design consideration in the engineering of

roadways and railways, as both are designed to tolerate a maximum weight-per-axle (axle load); exceeding the maximum rated axle load will cause damage to the roadway or rail tracks.

Cross Border Freight: The freight which crosses the border of the adjacent countries either on the same freight vehicle or transferred to another freight vehicle. The freight vehicle might be truck, railway, ship, aircraft, etc.

Equivalent Standard Axle Load (ESAL): Most commonly accepted indicator to equate damage from wheel loads of various magnitudes and repetitions to damage from an equivalent number of "standard" axle loads, one of which is a 8.2 tones (18,000 pound) single axle (the equivalent standard axle or EAS).

Freight: The goods which are transported by vehicle through a route.

Freight Flow: Movement of freight by keeping it on the freight vehicle.

Freight Forwarder : The agency which provides services of transporting freight including all logistics required for delivering the freight in the specified destination.

Gross Weight: The weight of a vehicle and /or vehicle combination without load plus the weight of any load thereon.

Gross Vehicle Weight: It is the total weight of the vehicle (including pay load) as specified by the manufacturer

Overload: An axle load, a load from a group of axles, or gross vehicle mass on a vehicle that exceeds the prescribed legal limits for the vehicle or for any particular part of public roads.

Payload: It is the carrying capacity of the vehicle. It is the difference between the gross vehicle weight (GVW) and unladen vehicle weight.

Truck: A motor vehicle designed, used or maintained primarily for the transportation of goods.

Traffic Volume: Number of vehicles of different categories plying on the road and it depends on duration of counting.

Weighbridge: A mechanical device or facility designed and installed to weigh a vehicle and its laden mass.

1.4 PERSPECTIVE USERS

Department of Transport Management (DoTM) is mandated to control vehicle overloading in Nepal. Therefore, the primary users of this guideline are officials of DoTM. The other perspective uses of this guideline are as follows:

- The traffic police associated with the enforcement of overloading control;
- The operators and drivers of vehicles;

- Department of Roads and Department of Local Infrastructure Development and Agricultural Roads (DOLIDAR) associated with design, construction and maintenance of road ;
- Roads Board Nepal;
- Traders and transport forwarders;

1.5 STRUCTURE OF THE GUIDELINES

This guideline consists of six (6) chapters followed by one (1) appendix. The structure of the guideless is designed in such a way that it covers both the weighbridges that are currently in operation and those which will be installed in the foreseeable future. Details of each chapter of this guidelines and appendix are shown below.

Chapter 1: This chapter provides background of the guidelines, scope and objectives of the guideline, and structure of the report.

Chapter 2: This chapter provides guidance on the selection and installation of weighbridges that DOTM shall consider. This chapter provides information about various types of weighbridge and measuring system with specific characteristics and minimum physical facilities required for them.

Chapter 3: This chapter provides the basic requirements of data collection, verification, analysis, and reporting which are collected at weighbridge station.

Chapter 4: This chapter provides information about various financing mechanism for installation and operation of weighbridge stations and information management system.

Chapter 5: This chapter provides information about operation and management of weighbridges.

Chapter 6: This chapter provides information about standard requirement for operation and monitoring of weighbridge operated by private sector.

Chapter 7: This chapter provides a generic guidance on various training for weighbridge personnel for operation of weighbridge.

The structure of the guideless should be such designed that it should cover both the weighbridges that are currently in operation and that are proposed to be installed in the foreseeable future. In general it should cover the following important elements:

a. Selection, Installation and Operation of Weighbridges

b. Weighbridge Data Collection and Reporting

c. Private Sector Participation and Financing Arrangements of Weighbridges

d. Cross Boarder Overload Control

e. Training of Weighbridge for Users

The guidelines should be in a generic form which would provide proper guidance to the users in general and the others involving in the control of axle loads. In this regard, as per the TOR the guidelines in the present case should be focused to train the DOTM personnel that are likely to involve in axle load control. At the same time, users other than the DOTM should also be benefited from it. Likelihood of involvement of the parties are the Traffic Police, DOR, Roads Board Nepal, operators and drivers of the public transport vehicles etc. In consideration of the guidelines the following elements are to be given due attentions:

- Existing statuary provisions and their effectiveness,
- Enforcement provisions and
- Public awareness programs.

The existing statuary provisions may or may not be sufficient for the purpose. Existing statuary provisions may have to be amended if found not compatible with the requirements. Similar is the case of enforcement provisions. Public awareness program is thought to play an important role in controlling the overloading the vehicles.

CHAPTER 2 SELECTION AND INSTALLATION OF WEIGHBRIDGE

2.1 BASIC STRATEGY ON SELECTION OF WEIGHBRIDGE

A basic policy of vehicle overloading control has been included National Transport Policy (2001) and Heavy Vehicle Management Policy (2005) by the Government of Nepal, Ministry of Physical Infrastructure and Transport. The heavy vehicle management policy covers a various aspects of vehicle overloading control from the perspective of Department of Roads (DOR) as the responsible organization. However, vehicle overloading control is DoTM's responsibility within the Ministry of Physical Infrastructure and Transport in the current responsibility assignment.

The strategy for selection of weighbridge includes various factors such as the purpose of the weighbridge it serves, the cost involved, the area where it is to be located, the system by which it has to be operated, the operating agencies and the working of the particular weighbridge. The primary purpose of the weighbridge in the present context is to control the overloading tendencies in the freight vehicles. At the same time, it may also provide the weight of the materials loaded in a freight vehicle that may not be the interest of the axle load controlling authority but it provides the necessary information of weight of transported materials to the operators and drivers of the vehicle as well as to the traders. The involvement of cost of buying and installing the weighbridges are another aspect while choosing the particular weighbridge. The compatibility of a weighbridge to the area where it is to be installed is another factor in this respect. Operation system of a weighbridge should be easy and the users are to be well versed to its operation. Running and operating as well as its maintenance cost can be another factor.

2.2 WEIGHBRIDGE TYPES AND WEIGHING MECHANISM

2.2.1 Weighbridge Type

There are various types of weighbridges for overloading control available in the international markets. However, it can be broadly categorized into two type based on its installation type; fixed weighbridge and portable weighbridge.

(1) Fixed Weighbridge

Weighbridges which are installed on the particular location by fixing (permanently) on the road surface or roadside are defined as fixed weighbridge. The characteristics of fixed weighbridge are:

- Easy to operate.
- Minimum personnel required.
- Possibility of cargo off-loading.

- Requires high installation cost.
- Limited placement and coverage.
- Relocation might be necessary when traffic flow characteristics are changed from the time of installation.
- Weighbridge station can be used for traffic management purpose also.

Fixed weighbridge can further categorized based on the capacity of axle load measurement as explained below:

(i) Single Axle Weighbridge

Single axle weighbridge is installed transversely along on the road surface and it can weigh one axle of a vehicle at a time. The typical size is generally 3.2m x 1m deck. When measuring number of individual axles, weighing shall be done by one by one and later shall be added to determine the total weight of vehicle or combination mass. Although installation cost of single axle weighbridge is cheaper in comparison to single axle unit weighbridge and multi-deck weighbridge, single axle weighbridge has number of drawbacks including:

- The installation sites have to be constructed to very precise level requirement which are not easily met.
- Weighing of multiple axles is cumbersome and time consuming especially for multi axles and articulated vehicle.
- Verification of scales is difficult due to difficulty of fitting the test weight onto the small deck.
- Setting up the site for overloading enforcement is time consuming.

Figure 2.1 Single Axle Weighbridge

(ii) Axle Unit Weighbridge

Single axle weighbridge is installed transversely along on the road surface and it can weigh a complete axle unit of a vehicle at a time. These weighbridges are typically 3.2m x 3m to 3.2m x 4m and comprise a single deck (usually 4 load cells) which can be connected to a digital weight indicator. A digital summary indicator can then be used to display the combined weight of the individual axles and axle groups to determine the total weight of the vehicle. These

weighbridges are typically suitable on strategic routes that carry less than 500 commercial vehicle per day.

Some of the advantages of the axle unit weighbridge are as follows:

- The weighbridge can weigh any axle unit of a truck (i.e. single axle, tandem axle or tridem unit)
- Level tolerances on the approach slabs no longer have to be as accurate as for the single axle scale but still need to meet minimum requirements
- Verification testing is relatively simple
- It is far quicker to weigh multi-axle vehicles than using a single axle scale but not as quick as using multi-deck scale.

Figure 2.2 Axle Unit Weighbridge

(iii) Multi-deck Weighbridge

Multi-deck weighbridge can weigh a vehicle as at a time even though the vehicle is multi-axles. Multi-deck weighbridge consists of a number of individual decks of different lengths. Each deck is individually supported by its own weighing mechanism (typically four load cells). The width of deck is typically 3.2m. The multi-deck weighbridges are usually equipped with four, decks although some have five, three or even two decks. In fact, number of decks can be determined based no type of vehicle plying on the roads.

When configured correctly, multi-deck weighbridges can individually display the weights of all axle groups of both the trucks and trailers. Digital weight indicators are assigned to each separate axle group weight and total weight can be determined by summing up all the individual weight measured in respective deck.

Multi-deck weighbridges are costlier in installation because it requires more number of individual decks and other associated facilities. It is typically suitable if freight vehicle is more

500 vehicles per day. There are many benefits of multi-deck weighbridge in comparison to other types of weighbridges and some of them are as follows:

- Level of tolerance on the approach slabs are no longer a problem because in most cases the whole vehicle is weighed in one operation.
- Vehicle weighing is very efficient.
- Short verification tests can easily be done without test weights because any axle or axle unit is weighed on each of the weighbridge decks and the results should be consistent.
- It is more difficult to manipulate the weighing process as in most cases the whole vehicle is weighed in a single operation.

Figure 2.3 Multi-deck Weighbridge

Note: Weighbridges installed by private sector in Nepal are multi-deck type, capable for weighing multi axle trucks, however, currently installed weighbridge displayed and printed gross vehicle weight only. Thus, weight by axle cannot be determined.

(2) Portable (Mobile) Weighbridge

Weighbridges which are not installed on the particular location by fixing (permanently) on the road surface or roadside are defined as portable (mobile) weighbridge. The portable weighbridges are particularly useful for unscheduled check of the vehicles in any section of the roads. The characteristics of portable weighbridge are:

- Wide coverage because it can transport and use in any location.
- It is difficult to selection of site.
- Generally high operation cost because all the team shall be mobilized simultaneously.
- Equipment can be damaged easily while using or transporting.
- Police cooperation is needed to stop and direct the vehicle to the weighbridge.
- As location might be at any place, traffic might be disrupted if the location is not in proper place from the point of view of traffic flow capacity.
- Frequent calibration is needed as it has to be transported so often.

These types of weighing equipment consist of wheel scales, which are placed on the road surface and wheels of axles of a vehicle is weighed and the total axle load is obtained by summing the wheel loads. There are both analog and digital systems in displaying the axle load. In recent days, a remote control type axle load reader is also available in the market. There are different types technologies and features are used in the measurement mechanism by the manufacturers. However, in general the core technologies of axle load measurement are; spring coil, electrical capacitance, and hydraulic types. Portable weighing equipment are light and can be set up by two operators in a few minutes and they can be transported in a light vehicle such as pick-up van together with the accessories such as leveling pads, computer, and cables. However, proper safety measures shall be taken while transporting, setting up and weighing.

Figure 2.4 Portable Weighbridge

Leveling mats or rams are necessary to align the levels of all axles unless the weighing equipment are used in a specially constructed pit in a lay-by. If the levels of all the axles are not within the tolerance limit, the load reading will not be accurate. Due to inconsistency of different variables such as one wheel system weighed at a time, undulation of the road surface etc. these type of weighing equipment may not be effective for axle load control. However, these can be used incorporation with the fixed weighbridges, and they can be used by the enforcing authorities who can divert an overloaded vehicle to the fixed weighbridges for accurately weighing for enforcement purpose. These portable weighbridges are considerably cheaper than fixed weighbridges, are relatively light, can be set up very rapidly and measure individual wheels, axles, axle units and gross vehicle weight / vehicle combination mass.

2.2.2 Weighing Method

There are two types of vehicle weighing method, namely static weighing and dynamic weighing. These weighing methods are applicable to both fixed and portable weighbridges.

(1) Static Weighing Method

In static weighing method, vehicle stop over the weighbridge until weighing is completed. The following are some characteristics of static weighing method:

- More Precision in comparison to dynamic weighing.
- Acceptable for legal enforcement because it can measure static mass of the vehicle.
- Slower; time consuming especially for single axle weighbridge.

(2) Dynamic Weighing Method: Weigh-In-Motion (WIM)

In dynamic weighing method, commonly known as Weigh-In-Motion (WIM), vehicle is weighed when vehicle drives over the weighbridge in a specified speed. This weighing method is applicable to both fixed and portable weighbridges. However, fixed type WIMs are becoming more popular in the recent days in advanced countries where legal enforcements are strictly adopted. The following are some characteristics of dynamic weighing method:

- Lower precision in comparison to static weighing method.
- Not acceptable for legal enforcement because it cannot measure static mass of vehicle.
- It is very effective in rapid monitoring of vehicle even in high traffic volume roads

A WIM system is a device that measures the dynamic axle mass of a moving vehicle to estimate the corresponding static axle mass. These systems are designed to capture and record axle weights and gross vehicle weights as vehicles drive over a measurement site at normal traffic speeds. Overhead variable message signs are used to redirect legally loaded vehicles back onto the highway while vehicles suspected of being overloaded are directed to an adjacent lane for accurate weighing on a static scale. Thus, the total number of vehicles to be weighed should be considerably less and a smaller facility may then be adequate.

WIM systems fall into two broad groups as follows:

· High Speed WIM (HSWIM) – vehicle travel > 15 km/h

· Low Speed WIM (LSWIM) – vehicle speed ≤ 15 km/h

WIMS have traditionally been used for screening rather than enforcement purposes at or near static weighbridges. However, the emergence of a new generation of single-axle weighing fixed WIMS allows vehicles to be weighed at slow speed (typically < 5 km/h) and with sufficient weighing accuracy (< 1%) for enforcement purposes. Although such systems have not yet been used widely in developing countries, they are worthy of consideration and offer an alternative to static devices if a rigorous evaluation confirms their long-term suitability for this type of weighing.

The different WIM devices are developed by the manufacturer, however, the most widely accepted and utilized devices are described below:

(a) Piezoelectric Sensor

The sensor is embedded in the pavement and produces a charge that is equivalent to the deformation induced by the tyre loads on the pavement's surface. It is common to install two inductive loops and two piezoelectric sensors in each monitored lane. A properly installed and calibrated Piezoelectric WIM system can provide gross vehicle weights that are within 15% of the actual vehicle weight for 95% of the measured trucks.

(b) Bending Plate

The bending scale consists of two steel platforms that are typically 0.6 × 2 m, adjacently placed to cover a 3.65 m lane. The plates are instrumented with strain gages, which measures tyre load induced plate strains. The measured strains are then analyzed to determine the tyre load. A properly installed and calibrated bending plate WIM system can provide gross vehicle weights that are within 10% of the actual vehicle weight for 95% of the measured trucks. Photograph 7-8 shows a typical bending plate high speed WIM device.

(c) Single Load Cell

This device consists of two 3 × 3 m platforms placed adjacently to cover the 3.65 m monitored lane. A single hydraulic load cell is installed at the centre of each platform to measure the tyre load induced forces that are then transformed into tyre loads. A properly installed and calibrated single load cell WIM system can provide gross vehicle weights that are within 6% of the actual vehicle weight for 95% of the measured trucks.

Table 2-1 Summary of Weighbridge Types and Weighing Methods

Types of Weighbridges / Method of Weighing		Fixed Weighbridge	Mobile Weighbridge
		▪ Easy to Operate ▪ Minimum Personnel ▪ Cargo Off-loading ▪ High Installation Costs ▪ Limited Replacement	▪ Wide Coverage ▪ Difficult Site Selection ▪ High Operating Costs ▪ Equipment Easily Damaged ▪ Police Cooperation ▪ Traffic Disruption
Static	▪ More Precision ▪ Accepted for Legal Enforcement ▪ Slower	▪ Easiest to Operate ▪ Highest Level of Precision ▪ Can weigh and Register Axle Groups	▪ Lowest Investment ▪ Optimal for Enforcement
Dynamic	▪ Rapid Monitoring ▪ Lower Precision ▪ Not Acceptable for Enforcement	▪ Rapid Monitoring ▪ Requires Large Installation ▪ Requires Careful Direction of Vehicles ▪ Generally not accepted for Enforcement	▪ Minimum Disruption of Commercial Traffic ▪ Lowest Accuracy ▪ Excellent for Statistical Monitoring

2.3 SELECTION OF WEIGHBRIDGE TYPE AND WEIGHING METHOD

The decision of choosing type of weighbridge depends on the various factors as cost, availability of other physical facilities including the manpower, and the purpose of installing such facility. The volume of the heavy vehicle traffic is one of the important factors in this regard. However, on the important routes where large numbers of heavy vehicles are to be weighed, multi deck weighbridges are recommended.

Table 2-2 Criteria for Selection of Weighbridge Type and Weighing Method

Criteria	Description
1. Installation and Operation Cost	Installation and operation of weighbridge requires significant costs. Installation cost is one time investment (initial investment), however, operation and management cost requires throughout its operation which is quite high. Also, weighbridge operation is not self-sustained only from the fines to be collected. Therefore, cost factor is paramount in weighbridge type and weighing method selection
2. Availability of Physical Facilities	As explained in the preceding sections various physical facilities are required inherent to the particular type of weighbridge type and weighing method, selection of weighbridge and weighing method are also dependent of the available physical facilities.
3. Human Resources	Operation and management of weighbridge required specialist of a different disciplines. Therefore, trained specialists of respective fields are needed for effectively operation and management weighbridge stations.
4. Required Precision	Based on requirement of precision, weighbridge type and weighing method shall be selected.
5. Installation Purpose	Selection of weighbridge type and weighing method is depends on installation purpose also. For instance, installation of weighbridge stations for axle load data collection for pavement design purpose and overloading enforcement are different.
6. Strategic Location in the Road Network	The weighbridge type and weighing method selection for strategic and locations of road network and other ordinary locations are different. For instance, weighbridge type and method near Inland Clearance Depot (ICD) may differ from ordinary road section.

2.4 SELECTION OF WEIGHBRIDGE STATION LOCATION

Location of weighbridge is strategically important in vehicle overloading control because it causes a huge economic loss in the national economy and transport safety. Therefore, attempt shall be made to minimize the impact of damage and it can be obtained by installing the weighbridges at strategically important locations as described below.

(1) Overloading Control at Custom Check Points

A large number of freight enters from custom check points (ICD and other check points) located in southern and northern part of the country established for checking and clearing customs coming entering from India and China. Transport entrepreneurs usually complain that the severity of overloading is much higher in freight vehicles entering from India (i.e. cross-border traffic). Therefore, attention shall be given to control cross border freight vehicles. Any freight vehicle entering to Nepalese territory shall be weighed before the custom check point. The custom officials shall only allow the cross border freight vehicles which are carrying permissible gross vehicle weight / axle load. Therefore, in order to control overloaded truck at the border, weighbridge stations shall be located before the custom check point located in various parts of the country.

(2) Overloading Control at Origins

Since extent of damage is proportion to the distance traveled by the overloaded vehicle, overloading control at freight origin is one the most effective and efficient measures in controlling vehicle overloading. Also, if vehicle overloading is controlled at the origin, there is very low possibility of a vehicle to be overloaded on the way to the destination because all trucks can be tracked in all weighbridges. Truck operators also prefer to weigh and control the vehicle overloading before departing from the origin with permissible limit. Therefore, weighbridges shall be located near the freight source. The following facilities / area are considered as the origin of the freight and thus priority shall be given for such location while selecting location of weighbridge stations.

a. Inland Clearance / Container Clearance Depot (ICD)

As Nepal is a landlocked country, most of the freight transported from the land. A significant volume of freight is transferred through the inland clearance depot. At present there are four ICDs in operation, namely in Birgunj, Biratnagar, Bhairahawa and Kakarbhiitta at the entry point of Nepal near Indian Boarder for freight coming to Nepal from India. Some dry ports such as at Larcha near Tatopani Customs, while another one has been planned in Rasuwa near the international border with China, for the freight coming to Nepal from China, are now under construction. Therefore, ICDs are the potential locations for installing weighbridges.

b. Industrial Zone

Government of Nepal has identified and defined major industrial area, industrial estate, and special economic zone for economic and industrial development of the country by attracting foreign and national investors to invest and establish industrial and business units.

(i) Major Industrial Area / Corridor

The following corridor and area are defined as major industrial corridor and area in Nepal. Among them some corridors are developed remarkably and the others are still under development though they are declared industrial corridor several years ago.

Table 2-3 Industrial Corridor / Area in Nepal

1.	Nepalgunj – Kohalpur Industrial Corridor	5.	Birgunj – Siamara Corridor
2.	Butwal - Bhairahawa Industrial Corridor	6.	Janakpur Area
3.	Sunwal – Gaidakot Industrial Corridor	7.	Biratnagar – Itahari Industrial Corridor
4.	Hetauda – Bharatpur Corridor	8.	Kathmandu Valley

(ii) Industrial Estate

The industrial estates established by the Government of Nepal are shown in **Error! Reference source not found.**.

Table 2-4 Industrial Estates in Nepal

1.	Dharan Industrial Estate	7.	Bhaktapur Industrial Estate
2.	Dhankuta Industrial Estate	8.	Pokhara Industrial Estate
3.	Gajendra Narayan Industrial Estate	9.	Butwal Industrial Estate
4.	Hetauda Industrial Estate	10.	Nepalgunj Industrial Estate
5.	Balaju Industrial Estate	11.	Birendranagar Industrial Estate
6.	Patan Industrial Estate		

(iii) Special Economic Zone (SEZ)

Special Economic Zone (SEZ) is the advanced concept of export processing zone and also called the "Free Trade Zones" which includes export processing zones, special trade zones, tourism entertainment zones, information technology parks, banking, etc. SEZ planned by the Government of Nepal is shown in **Table 2-5**.

Table 2-5 Proposed Special Economic Zones (SEZ) in Nepal

SN	Special Economic Zone Name	SN	Special Economic Zone Name
1.	Dhangadi	9.	Panchkhal
2.	Jumla	10.	Simara
3.	Nepalgunj	11.	Rautahat

4.	Kapilvastu	12.	Dhanusa
5.	Bhairahawa	13.	Siraha
6.	Gorkha	14.	Biratnagar
7.	Nuwakot	15.	Jhapa
8.	Simara		

Source: Special Economic Zone Development Committee, Ministry of Industry, Nepal

(iv) Mega Projects

Mega projects such as hydro-electric projects and other infrastructure construction projects are the potential areas for the origin of vehicle overloading particularly during the construction stage because the projects will transport both machineries and construction materials. Therefore, weighbridge should be installed at entry point of the main road to prevent road pavement and road structures from the possible damage. However, weighbridge in such area might be temporary if vehicle overloading is expected only during the construction stage. If overloading cannot be avoided because of type of freight characteristics, diversion road or special permission is required.

2.5 WEIGHBRIDGE PHYSICAL FACILITIES AND INSTALLATION

2.5.1 Weighbridge Physical Facilities

Operation and management of weighbridge requires various kinds of physical facilities. A physical facility which consists of weighbridge (weighing device), and other physical facilities are defined as weighbridge station. A weighbridge station typically consists of the following facilities but not limited to:

Table 2-6 Typical Physical Facilities of Weighbridge

SN	Facilities Name	SN	Facilities Name
1.	Entry Bay (Approach road)	8.	Staff Canteen / Kitchen
2.	Weighing Bay	9.	Toilets
3.	Exit Bay (Exit Road)	10.	Traffic Handling Post
4.	Weighbridge Control Room	11.	Parking Lot
5.	Operation and Monitoring Room	12.	Off-loading Yard & Storage Warehouse
6.	Drainage Pit	13.	Fence / Compound Wall
7.	Office and Accommodation	14.	Additional Traffic Management Facilities

The actual size of the weighbridge station depends on the various factors such as: the length and breadth of a weighbridge, requirement of other facilities as office room, weight record cabin, rest room and toilet facilities, parking lot, storing spaces for the off loaded goods and other

facilities required for enforcing agencies like traffic police etc. This is also dependent upon the available land for establishing the station.

2.5.2 Schematic Diagram of a Typical Weighbridge Station

The layout of weighbridge station is slightly differed by weighbridge type and weighing method. The layout of weighbridges can vary considerably depending on a variety of factors including:

- Weighbridge type
- Purpose of the facility (enforcement or data collection for pavement design)
- Prosecution of overloaded heavy vehicles
- Screening heavy vehicles only
- Screening and prosecution of heavy vehicles
- Volume of heavy vehicles to be weighed

Typical layouts of static - fixed weighbridges are shown in Figure 2.5.

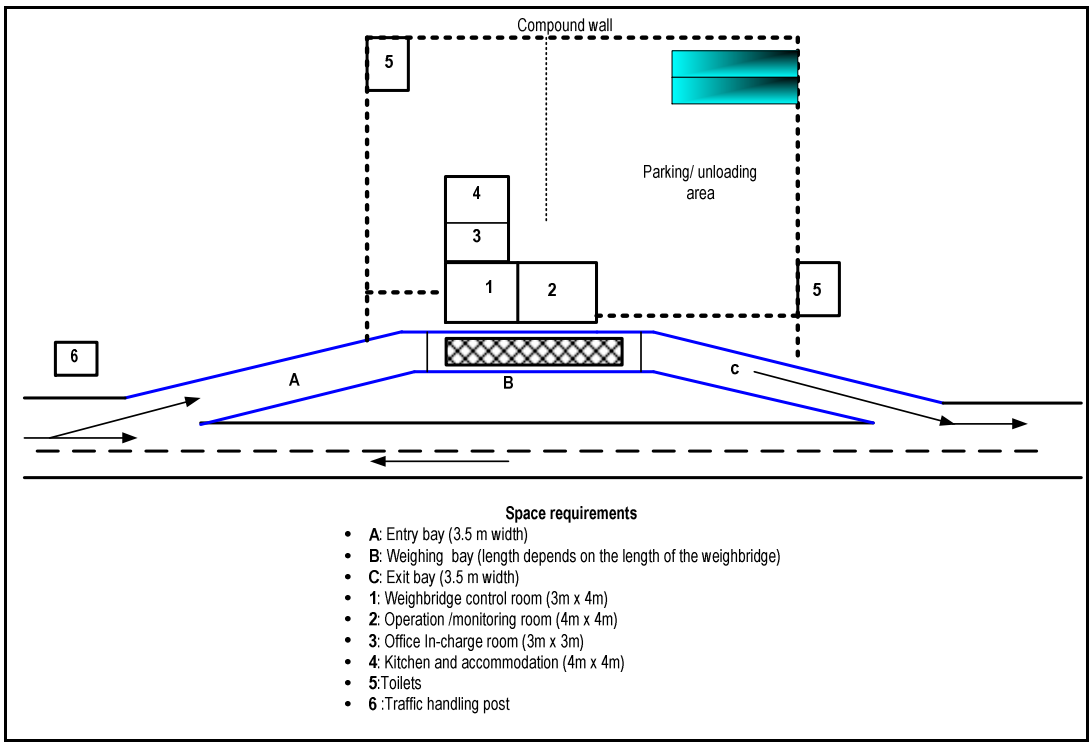

Figure 2.5 Schematic Diagram of a Typical Weighbridge Station -1 (Static and Fixed)

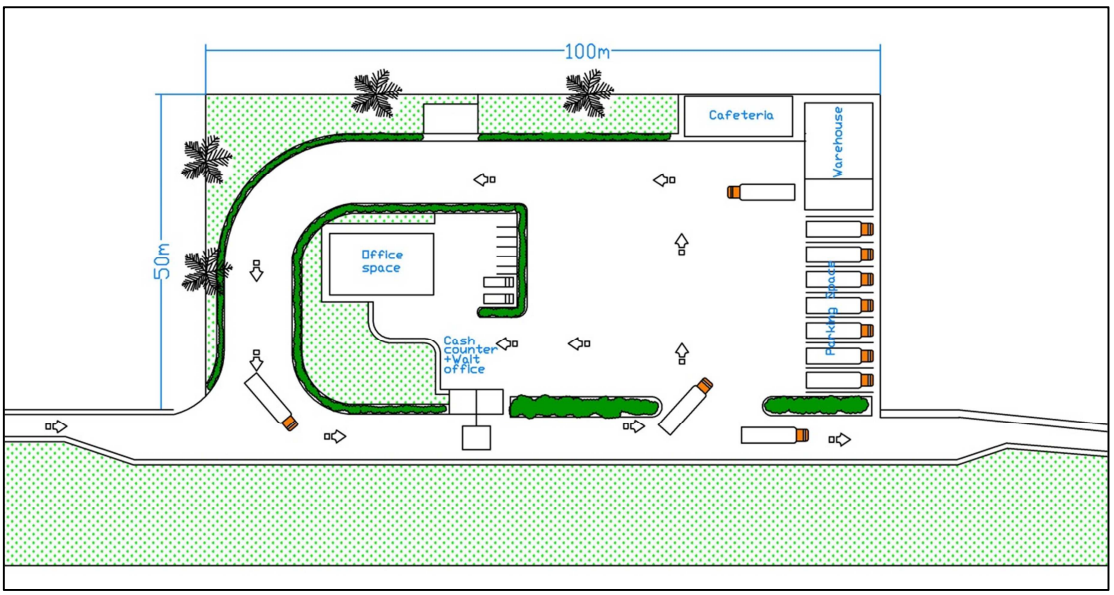

Figure 2.6 Schematic Diagram of a Typical Weighbridge Station -2 (Static and Fixed)

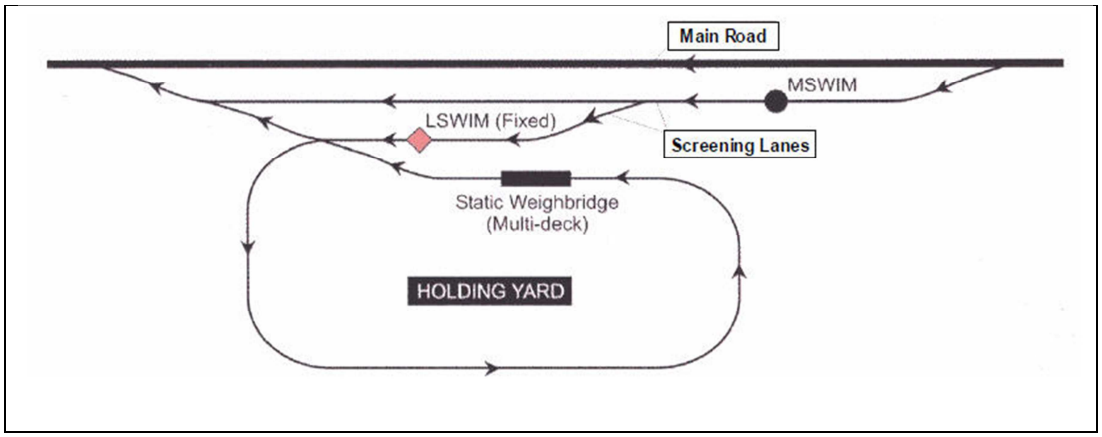

Figure 2.7 Schematic Diagram of a Typical Weighbridge Station -3 (WIM and Fixed)

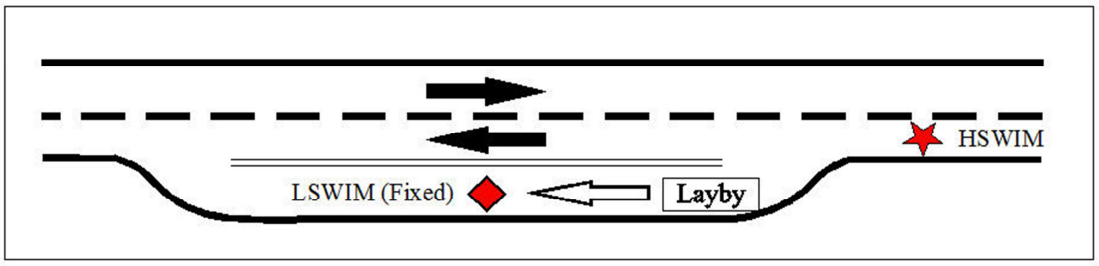

Figure 2.8 Schematic Diagram of a Typical Weighbridge Station -4 (WIM and Fixed)

2.5.3 Weighbridge Installation

Installation method of weighbridge station depends on type weighbridge and weighing method. Installation of static weighbridge station is relatively simple and less costly. However, installation of WIM weighbridge is relatively complicated and more costly because it needs more sophisticated equipment / facilities. The layout of a weighbridge requires very careful consideration of the agency associated with establishing the weighbridge. Since installation of weighbridge station includes various hardware, software and civil works such as load cells, sensor, camera, software, traffic signals, database software, construction of buildings, drainage pit, traffic signals, parking lot and warehouse. The design and specifying the weighbridge is generally entrusted to a consultant, and after that it would follow the normal project cycle such as tender process, selection of the contractor and construction supervision.

The specifications of the manufactures need to be followed strictly for the installation of weighbridges and to be adhered to during the construction. The scales can be installed in shallow pit, deep pit or above the ground according to the options provided by the manufacturers. The advantage of the above ground installation is that it is easier to keep clean, easier to maintain and it is cheaper to install. Drainage problem is also eliminated but it is vulnerable to damage be it by accident or by intentions. It requires upward and downward ramps for loading and unloading and hence the operation is difficult and this system is not generally favored. Shallow pit installations can be recommended where there is a drainage problem but it is very difficult keep the scale clean. Deep pit installation is favorable as there is enough space for a man to stand below the weighing deck and thus the sensitive mechanisms of the scale is protected and easier than the shallow depth scale to maintain and keep it clean. However, deep pit installation if not designed properly drainage can be a problem.

The typical layout of static weighbridge station detail is shown in the Annex-I of this report. The specification details of the pit type weighbridge station is provided in the Annex -II.

CHAPTER 3 DATA COLLECTION, ANALYSIS AND REPORTING

3.1 BACKGROUND

The ultimate purpose of installation of weighbridges is to control vehicle overloading by measuring the vehicle load precisely and enforce the legal provisions accordingly. Therefore, vehicle overloading data collection is the core of the vehicle overloading control because unless there are reliable measurement data, effective enforcement is impossible. With the advancement of weighbridges technology particularly computerization, data collection, and storage (database) become straightforward. In order to control vehicle overloading effectively, a proper planning is required based on the data analysis. Data analysis such as statistical and trend should produce statistics and reports that will be of interest from various perspectives (strategic, management, administrative, financial, technical, etc.) of vehicle overloading control. An effective reporting mechanism is equally important to make all the measurement records and enforcement details transparent to all stakeholders because vehicle overloading control interventions are usually the issue of transparency. In this regard, a systemic data collection, analysis and reporting mechanism is the utmost import.

As in the case of many management systems, the main purpose of collecting and analyzing overload control data is to improve the effectiveness of the operations. Where the weighbridge is fed by vehicles on various (alternative) routes, the extent and degree of overloading on each route can be assessed and appropriate measures can be taken. Overloading patterns in terms of the different mass regulations (axles, axle units, vehicle / combination masses) can be assessed. This information can be used to focus on law enforcement activities on “frequent offenders”. Analysis of weigh data per commodity type can assist law enforcement authorities to focus on problem commodities as well as to target particular origins of these commodities such as construction materials, mining and petroleum products.

3.2 DATA COLLECTION

The responsibility of data collection is depends on operation mechanism of weighbridge, however, the overall responsibility of data collection and monitoring fall under the responsibility of DoTM. If the weighbridge is operated by private sector, DoTM should be more focus on monitoring of the effectiveness of vehicle overloading control. The monitoring can be of two types; (1) effective operation of weighbridges as per the DoTM’s regulation, (2) effectiveness of vehicle overloading as an end result.

The number and type of data that should be collected from weighbridge station should be clearly defined and these data should be consistent for all weighbridges operated by DoTM or private sectors in the entire country. With the advancement of information technology in the recent year and incorporation of such technology in weighbridges operation, data collection task have become more precise and cost effective.

3.2.1 Data Requirements

Various kinds of data are needed to be collected for effective management of vehicle overloading control and utilization of such data for the future. Since pavement, bridge and automobile (motor vehicle) technology is advancing day-by-day through the research and development work, vehicle overloading data are very much important for road operator for making appropriate policies for vehicle overloading control and road transport logistics management. The data to be collected can cover a number of aspects of the overload control operations including:

(1) Administrative Details

The following minimum administrative data should be collected for record keeping purpose.

- Weighbridge Stations Name and Number
- Operating Officer
- Shift Records
- Road Name and Route Number

(2) Static Weighing Details

During the process of static vehicle weighing for law enforcement purposes, certain data should be collected for record and analysis purposes. The minimum data that should be recorded are as follows:

- Sequence Number
- Weighbridge Model
- Date and Time of Weighing
- Vehicle Registration Number
- Name of Truck Operator
- Axle Configuration
- Permissible Axle / Axle Unit Weight
- Actual Axle / Axle Unit Weight
- Gross Vehicle Weight (GVW)
- Commodity Transported

(3) Vehicle Overloading and Fining Details

The following vehicle overloading and fining details should be collected.

- Trip Origin
- Trip Destination
- Distance up to Weighing Stations
- Overloaded Weight
- Number of Offences in a Year
- Total Fines

- Charging Officer
- Mode of Payment
- Date of Payment

(4) Data Collection Systems

The computerized weighbridge systems have their own standard data collection system developed by manufacturer. However, such standard system shall be customized to meet the needs of the implementing agencies, particularly in terms of vehicle overloading control regulations such as permissible weight and fine system. The customized software packages for data collection should be developed by considering all relevant regulatory provisions, fine system, payment modalities, and weighbridge station details. The software package should be fully compatible with the Axle Load Control – Management Information System (ALC-MIS) of the DoTM (i.e. compatible standard database system such as My SQL, SQL Server, and Oracle.

In order to effective and transparent weighbridge operation system, inventory, regulatory provisions, fine calculation system, payment details should not be allowed manual input in the software package. Selection of axle configuration system should be provided in the software. The data collection system should have print function also. The data collection system (i.e. software package) should be open source so that DoTM can upgrade easily when there will be any changes in the regulatory provisions, weighbridge stations, and ALC-MIS.

3.2.2 Data Export and Data Sharing

Data exporting from weighbridge or central database is necessary for performing data analysis as per users' requirement. Therefore, data export function should be in-built in data collection system at weighbridge station and ALC-MIS (i.e. at central database). A dynamic search function (i.e. users' defined search criteria) is necessary for searching the data. The search and export function should have following functions but not limited to;

- Data search and export of selected route
- Data search and export by route
- Data search and export by weighbridge station
- Data search and export of multi axle truck
- Data search and export by date (day, month, year)

The system should allow the users to export the data either in MS-Excel (.xls), Comma Separated Values (.csv) or Portable Document Format (PDF).

It is presumed all weighbridge stations are connected to ALC-MIS. ALC-MIS is a web-based management information system. All data collected at weighbridge stations are automatically stored in central database (i.e. ALC-MIS) and shared among the authorized users. It is recommended that administrative rights shall be provided to the authorized users for downloading, editing etc. However, in case of any internet connection problem with central

database, alternative methods of data transfer shall also be considered. The alternative method of data transfer might be via email, USB or CD-ROM.

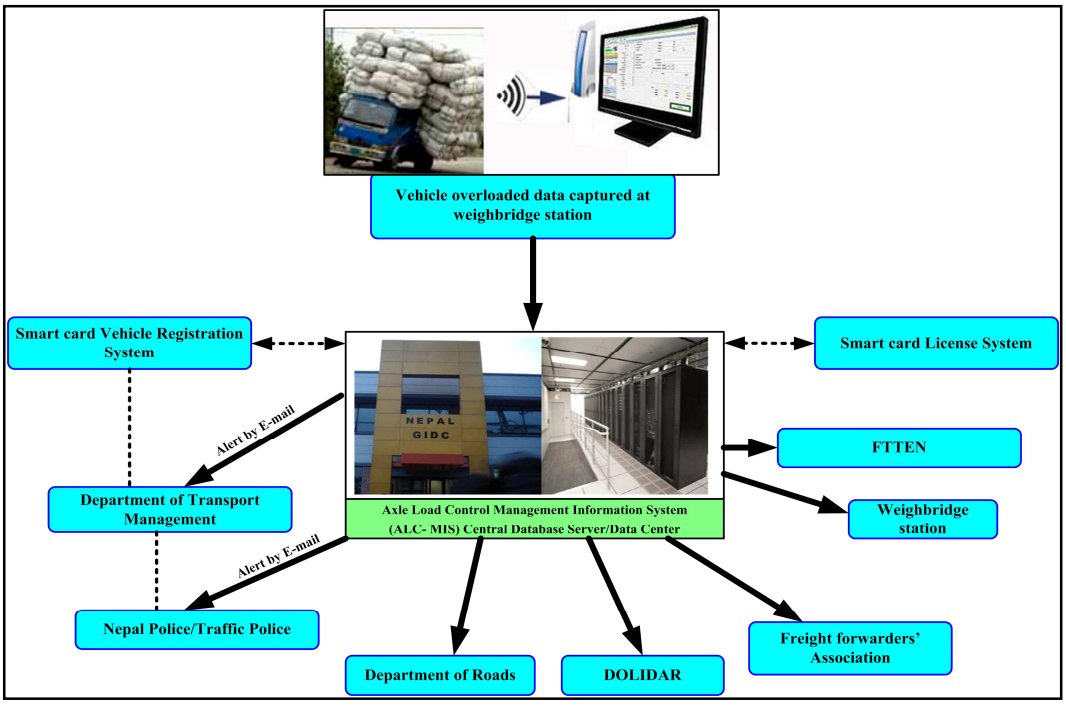

Figure 3.1 Proposed Design of ALC-MIS

3.3 DATA VERIFICATION AND ANALYSIS

3.3.1 Data Verification

A credible data is much important in any database system. Therefore, data collected through weighbridges should be checked carefully so that any decision made based on the result of analysis will be more effective. Before data analysis, adequate verification must be done to ensure that invalid data is excluded. Data input control shall provide in the computer weighing software. Adequate data verification during the weighing process significantly simplifies the task of data verification at the data analysis stage. The computer software should check invalid data before storing it into the database. Drop down menus should be provided as much as possible if there will be multiple choices in selection because manual input may have high possibility of inputting data in wrong format such as wrong spelling, number in out of range and mismatch of text and number. Error message should display by the system if any of the data inputted are not compatible with the database system or does not meet the validation criteria.

Once the data from all the weighbridges has been consolidated into a single database, further data verification and other checks should be performed to ensure data integrity as far as is possible. This process would include checking for unrealistically high overloads (in terms of axles, axle units, gross vehicle weight) and correct spelling of operator names and commodities.

3.3.2 Data Analysis

As explained in section 3.3.1, before data analysis, adequate verification must be done to ensure that invalid data is excluded. Data which are verified and stored in an electronic format (i.e. database) analyses should be carried out in order to determine various overload control statistics, including long term trends such as by route, by commodity type and by weighbridge station. Such analyses should produce statistics and reports that will be of interest from various perspectives such as strategic, management, administrative, financial, technical, cross-border.

Data analysis tool (computer software) that is used for such analysis is usually incorporated in ALC-MIS. The outputs should include basic statistics (such as number of vehicles weighed and overloaded during the period being analyzed) as well as more detailed statistics such as overloading information regarding specific transport operators and commodities. A dynamic report creation or analysis function which can customize the required data for the analysis should be provided so that user can analyze and create the report in an efficient way.

The usefulness of ALC-MIS is only fully realized when a number of years of data have been collected and utilized for analyzing short, medium and long term vehicle overloading trends. In most cases, the calculations required for reports are not complex. Maximum overloads should be calculated, particularly per operator or commodity type, route, etc. Average overloads should be calculated such as per weighbridge, selected operators, commodities, and vehicle type. The road damage factor per vehicle class can also be calculated.

3.4 PRESENTATION AND REPORTING

The collected and analyzed data can be presented in various formats such as tabular format, and graphs. Without effective methods of presentation and reporting, the considerable effort and expense of collection and analysis cannot be effective. Therefore, reporting in an impressive and effective way is very much important.

The most common types of reports of vehicle axle load control are monthly and annual reports. The report should focus operational aspects, technical aspects and policy aspects. In the case of monthly reports, processed data, in the form of tables and/or graphs, should indicate statistics for the current month whereas annual report should summarize the overload control operations both on a monthly basis (for the year being reported on) as well as comparing the annual statistics with previous annual data (if available). Once data have been collected for a number of years, medium and long terms trends can be evaluated. The annual report shall also include recommendation for improvement in the administrative and regulatory provisions if sought necessary. This could include the impact of a change in legislation, the implementation of an overload control strategy or the construction or upgrading of one or more weighbridge sites.

CHAPTER 4 FINANCING MECHNAISMS FOR WEIGHBRIDGES

4.1 INTRODUCTION

Financing in the setting-up, ongoing operations and maintenance of weighbridges is the key element in the axle load control in a country. There can be many approaches in this respect and without proper mechanism for financing both in the short term and long term basis; overload control in a country like Nepal cannot achieve the anticipated goal. This chapter describes the possible sectoral involvement in financing, risk associated while involving a private sector and the mechanisms involved in this area.

4.2 PUBLIC SECTOR INVOLVEMENT

One of the possible sectors in financing the weighbridges can be the Government of Nepal directly funding through its annual budget to be implemented by DoTM. For lack of proper resources, if the government cannot finance through its internal resources it can approach international financing agencies like the World Bank, Asian Development Bank or other international financing agencies either in long term loan or the other agencies which provide grant in aid. These types of financing generally follow the normal project cycle, planning, procurement and implementation. However, involvement of international agencies in general will involve only up to the establishment of weighbridges and once it is established and run the day to day financing for the running the operation and maintenance lies on the government and the necessary financing has to come from the government itself.

4.3 PRIVATE SECTOR INVOLVEMENT

Since, there can be involvements of multi discipline in axle load control in the management, operation and maintenance and these may not the direct function of the government. The possible disciplines are as:

- Legal frames
- Electronic systems
- Computer systems
- Mechanical systems
- Traffic regulations
- Personnel management
- Operation and maintenance management
- Roads pavements and signs
- Utility services water, electricity etc.

Private sector has already proven that they are capable of running weighbridges in Nepal. Since fifteen (15) weighbridges are currently operated by private sector in the country. Further, the

private sector is planning to introduce smart card system for truck services for tracking and monitoring purpose in the country by establishing the central web-based database system.

It is noteworthy that the overload control is not financially sustainable if the whole operation is left on the shoulders of the private sector. Keeping this fact in mind the government can make some sort of additional service contracts with the private sector which generally the government shall carry out either directly or outsourcing. Once, the operation is enhanced and certain standards are established the government can take over the operation. The services may include but not limited to:

- Operation of weighbridge
- Road worthiness test
- Driver license inspection
- Driver fitness and competency
- Traffic data collection
- Road safety; speed control; drinking and driving etc.

4.3.1 Types of Private Sector Involvements

The involvement of private sector can be made in a number of modalities. Generally there are following types of private sector involvements:

- Service contract
- Management contract
- Lease contract
- Concession
- Full privatization

The characteristics of various types of contract and their responsibilities between public and private sector in the operation and management of weighbridge facilities are summarized in **Table 4-1**.

Table 4-1 Options of Private Sector Involvement in Overload Control

Item	Service Contract	Management Contract	Lease Contract	Full Privatization	Concession
Ownership	Public Sector	Public Sector	Public Sector	Public Sector	Private Sector
Financing Fixed Assets	Public Sector	Public Sector	Public Sector	Private Sector	Private Sector
Financing Working Capital	Public Sector	Public Sector	Private Sector	Private Sector	Private Sector
Duration	Short (1–3 yrs)	Short (5 yrs)	Medium (6–10 yrs)	Long (20–30 yrs)	Indefinite
Risk	Public Sector	Public Sector	Public Sector	Shared	Private Sector
Remuneration of Private Sector	Operation and management (O&M) costs	O&M costs	O&M costs and working capital	O&M costs, working capital and financing of fixed assets	

(1) Service Contract

For a service contract, the private sector is involved in the operation and maintenance of the facility for a specific period. This involves the government to carry out the following:

- Preparation and receiving the tenders
- Tender evaluation
- Supervision and control

The private sector is paid certain amount depending upon the contract and it can be a lump-sum or time and cost basis. Capital investment may or may not be the responsibility of the contractor. Duration of the contract period will be as set forth in the contract.

(2) Management Contract

In management contract, the financing of the facility is not the responsibility of the contractor. The contractor is involved in the total operation and maintenance of the facility. The management contracts can be made for a reasonably considerable period and the contractor must have reasonable autonomy from the owner for its successful implementation.

(3) Lease Contract

A lease contract is yet another type of contract on which the private sector takes the facility in rental basis and the lessee finances working capital and operates the facility.

(4) Concession Contract

In Concession contract the private sector takes responsibility in managing, operating and invests in reconstruction, upgrading, rehabilitation and maintenance of existing facility. The government gets certain fee from the concessional contractor. The assets are usually owned by the government and handed over to the private concessionaire for the concession period. The assets are well managed during the concession period. At the end of the contract the assets are returned to the public sector in a specified condition. It is envisaged in this type of contract that the concessionaire will generate sufficient fund to run the facilities and usually some fee will be paid to the owner. Such contracts generally have a concession period of between 25 and 30 yeras, for recovering the investments made by the public sector. Such contracts can be one of Build Operate Transfer (BOT), Build Own Operate and Transfer (BOOT), Build Transfer Operate (BTO), Build Lease Transfer (BLT), Rehabilitate Own Operate (ROO) and Rehabilitate Operate Transfer (ROT) models.

(5) Full Privatization

Full privatization of government owned facilities involves in selling the full assets to the private sector and it will carry out the envisaged work.

Choosing a particular type of privatization mainly depends on the following factors:

- Financing to the assets
- Raising working capital
- Maintenance of assets
- Share of risks between the owner and the private sector
- Revenue generation to the private sector

In case no finance is required by the private sector then a service contract can be appropriate and if the project can generate a considerable revenue then concession arrangement can be viable.

Considering the axle load control operation at the present scenario a lease or concession contract may not be feasible as this operation cannot raise sustainable revenue. The viable options left are either the service contract or the management contract. In these two options the government has to finance for the assets and running capital required for overloading control.

For controlling of the overloads full privatization may not be possible due to the fact that the enforcement has to be carried out by the enforcing agencies DoTM and traffic police and this may not be viable option either.

Considering the above points a mixed type of contract of management contract and concession contract may be viable.

4.4 RISK ASSOCIATED WITH INVOLVEMENT OF THE PRIVATE SECTOR

One of the key issues in the involvement of private sector is to share the risk between the owner and the private party. Associated risks can be financial, technical and operational and the sharing of these risks is to be well defined before entering into a contract.

Some of the prominent risks are as discussed in the following sub-sections.

4.4.1 Service provided not to the Standards

One of the major risks associated through the involvement of private sector is the level of service which is not provided to the anticipated standards. The private party can be panelized if the service given is not to the required level.

4.4.2 Counter-party Risk

This is the most common risk that the parties involved do not meet their contractual obligations. This may be associated with the construction companies, suppliers, customers or any party which fails to carry out its obligations. This risk can usually be addressed by getting a performance guarantee through a recognized third party financial institution.

Considering the overloading control operation, the law enforcing agencies specially the traffic police may not have sufficient manpower to co-operate the private sector at the weighing stations to divert the traffic and the performance of overloading may be bugged up. The government (DoTM) should carry this risk. In such cases the payments to the private sector are to be ensured for the periods when weighing of vehicles is not possible.

The success of any overloading endeavor depends mainly upon the enforcing agencies and it should be well defined the responsibilities to be carried out by each party before entering into a contract.

4.4.3 Force Majeure Risk

These are the risk associated with the occurrence of unexpected natural or manmade events beyond the control of either party such as earthquakes, floods, war, public rebellion etc. which may affect adversely the working of a project. The force majeure risks are taken by the owner and should be addressed in the contract.

4.4.4 Demand Risk

This risk does reflect in the increase or decrease of services due to factors like increase in cost of construction material, fuel, labor charges and that in case of overload control increase or decrease in traffic due to new sectors opened up or new parallel road made or so. This is also associated with the new legislation being enacted by the government or new requirements due to other factors like safeguarding the environments etc. All such demand risks should be the responsibility of the owner and increase or decrease of revenue to be adjusted accordingly.

4.4.5 Operation Risk

The risks relating to operations such as labor force, maintenance, faulty designs, fault in construction which does not meet the anticipated standards and adversely affect in the operation can be termed as operational risks. This risks result in time and cost overruns together with affecting in the quality of standards. Mitigation measures may include labor friendly policies, labor contracts, supply of long term fixed cost materials contracts, proper insurance and adhering to the rules regulations properly.

In case of weighbridge operation, weighing of vehicles may be stopped due to breakdown of weighing scales be it a minor case but it may sometimes takes longer than anticipated time to fix it, in this case the private sector loses the revenue, and proper provision in the contract to give exemption if the weighing could not be carried out beyond certain period may address this risk.

4.4.6 Regulatory Risk

Regulation of overload control is done by the existing law. Changes in the legislature and enacting new law may have effects on overload control. There should be provision to address such future changes in the contract.

One of the important factors to be addressed in the overload control mechanisms could be judicial system and as such the overloading cases finally may go to a court of law and evidences are to be kept intact by the enforcing agencies.

4.4.7 Technology Risk

Technology may change over time, and the services given by the existing technology may not be adequate. The effect of technology change can be mitigated by drafting a proper contract document giving room for such changes.

4.5 FINANCING MECHANISMS

Financing mechanism of axle load control facility should consider total life cycle cost including its installation maintenance and operation. While considering the life cycle cost it should include the following:

a. Initial Costs

The following costs shall consider as initial costs of the weighbridge operation and management.

- Planning and design cost
- Land cost
- Construction cost
- Logistics: equipment, vehicles, furniture, computers, software etc.
- Commissioning and
- Training (Initial)

b. Operating Costs

The following costs shall consider as operation costs of the weighbridge operation and management.

- Staff salary and benefits
- Management cost
- Consumables
- Vehicles
- Training (on-going)
- Scales checking and verifications by Nepal Standards
- Up-keeping and maintenances of facilities

- Replacement of old facilities
- Vehicles running cost etc.

Once the facilities are established the operating costs are sometimes underfunded and this will be detrimental to the whole system of overloading control and the government should be fully committed to finance adequately for operating costs

4.5.1 Sources of Funding

Weighbridge installation, operation, and management require a substantial amount of financial resources if it is installed and operated nationwide. The developing countries like Nepal, it might not be feasible to spend such a huge investment in axle load control. Therefore, various funding schemes can be considered for effective and efficient operation and management of weighbridges. There can be various sources of funding as discussed below:

(1) Fully Government Financing

Government funding can be done for the establishment of facilities and their operation. The initial cost for a weighbridge station is one time investment whereas its operation and management needs annual budget and it can be managed by government regular budget. This option suffers from the lack of fund available with the government and if the government does not consider the axle load control as its priority. Moreover, if initial funding for the establishment is somehow made by the government and the adequate funds are not provisioned in the yearly budgets the operation cannot achieve the goal of axle load control.

(2) Donor Funding

At present Donor Agencies like the Word Bank seem to be interested for the establishment of some new weighbridges and this operation is funded on a project basis but long term commitment for the operating cost may not be either possible or practical for a donor. Hence, there should be guarantee that the long term operating cost will be made available by the government.

(3) Private Funding

Privatizing the whole operation seems not feasible at this time around as the axle load control operation is not financially sustainable. Moreover, the FTTEN is financing and running a number of weighbridges in the country and present survey conducted by this study showed that they are not effective in controlling the axle load. This is due to the fact that the over loading and controlling cannot be done the same entity if proper monitoring is not done by the government. Therefore, there might have complains / objections from other private sectors if operation and management of weighbridges are solely handed over to FTTEN.

4.5.2 Recommended Financing Model

Axle load control issues are getting importance to the road authorities. Installation of weighbridge stations for the overloading control is one of the effective way in this regard. However, the financing model for the effective measures is the collaboration among public private sectors. The Public Private Partnership (PPP) model is recommended for the appropriate model for the financing of weighbridge stations. Contributions for the establishment from the Government i. e. public sector may include land provision and construction of weighbridge station. Similarly, private sector involvement may be to construct the station, operation and maintenance.

CHAPTER 5 WEIGHBRIDGE OPERATION

5.1 GENERAL

In the preceding chapters, planning issues of vehicle overloading control are discussed. The ultimate goal of vehicle overloading control can be achieved only by operating the weighbridges properly. Vehicle overloading control is a challenging task and it can be achieved only if there is competent team, clear legal provision, competent hardware and software for its operation and clear responsibility assignment among concerned stakeholders. This chapter attempts to cover these various aspects of weighbridge operations and management.

5.2 WEIGHBRIDGE OPEATION

Weighbridge operation includes a number of managerial and operational aspects as described in the subsequent chapters.

5.2.1 Required Human Resources

Weighbridge operation requires of specialist of different fields. A competent team lead by Information Technology specialist shall be at DoTM to look after all aspects of ALC-MIS. Similarly, each weighbridge station shall have sufficient number of human resources to operate weighbridges in 24 hours a day. A weighbridge station typically requires 10-15 personnel comprising of administrative, traffic police, technical and supportive staff for its effective operation. **Table 5-1** shows a typical list of weighbridge operation and management team. However, number of staff depends on affordability of weighbridge operating agencies and facilities available in the weighbridge station.

Table 5-1 Personnel for Weighbridge Operation

SN	Field of Expertise	Number	Key Responsibility	Remarks
A. Weighbridge Management				
1	Director of operation	1 Person	Directs the division	
2	Manager of Axle Load Control	1 Person	Oversees the overall management of the stations	
3	Weighbridge Controller	1 person/station	Oversees overall activities at each weighbridge station; reports to the manager of axle load control of each station	
4	Assistant Controller	3 person/station	Oversees activities at each weighbridge station in shifts under the guidance of the weighbridge controller	1 person/shift

5	Scale Attendants	6 persons/station	Conducts actual weighing	2 person/shift
6	Weighbridge Assistant	3 persons/station	Support staff for each station	1 person/shift
B. Enforcement Officers				
1	Traffic Police Officers	3 person/station		1 person/shift

5.2.2 Guidelines and Manual

DoTM shall provide all required relevant guidelines and manuals such as data collection system manual, ALC-MIS operational manual and weighbridge operation guidelines. Such guidelines shall contain the type of data collection, reporting format, operational procedure of weighbridges, etc. These guidelines and manuals shall make available at all weighbridge stations. These guidelines and manuals shall update accordingly if there will be any changes in the software and operational procedures.

5.2.3 Installation of Weighbridge

Upon decision of installation of weighbridge (truck scale) in a particular location, weighbridge including all required physical facilities shall be installed under supervision of respective experts. Test operation shall be conducted of all its components. After installation of weighbridge, installation completion certificate shall be issued by DoTM.

5.2.4 ALC-MIS Installation

Upon completion of installation of weighbridge (truck scale) and physical facilities, ALC-MIS shall be installed under supervision of ALC-MIS expert. The test operation shall be done to ensure that data collected from weighbridge is properly stored in ALC-MIS system and accessible to the specified users.

5.2.5 Weighbridge Verification and Calibration

The use of any weighing equipment used by the public, such as a weighbridge, is regulated by law. The principal legislation affecting the use of such equipment is normally contained in the Weights and Measures Acts of most countries. Under that legislation weighing equipment must be individually verified by an authorized Inspector with a stamp of verification and a certificate of verification issued by the inspector.

In essence, the verification process basically involves placing standard weights that are calibrated and traceable to the national standard on the scale(s) and then confirming that the reading given is within the tolerance limits (see Photograph 7-9). The frequency of verification is prescribed in the Act.

Failure to comply in all respects with the legal requirements of the Weights and Measures Act, including the verification procedures, would render weighbridge operations illegal.

Calibration of a weighbridge is the carrying out of a set of prescribed operations which establish, under reported conditions, the relationship between the weighing system output and corresponding known values of the load applied to the weighbridge. The calibration exercise is normally carried out by an accredited body in accordance with a prescribed procedure such as that contained in A Code of Practice for the Calibration of Industrial Process Weighing Systems, October 2003 published as – BS EN ISO 9000 series of Quality Management and Quality Assurance Standards as issued by the Institute of Measurement and Control in the UK.

The result of the calibration is normally reported in a formal document – the certificate of calibration – which includes a variety of data deemed relevant by the calibrating authority. The data obtained as a result of the calibration operation may be used to estimate the weighing system errors or to adjust the system output to an agreed specified value.

5.2.6 Operation Hour

The weighbridge shall be operated 24 hours a day in 365 days. Based on availability of human resources, working shift shall be set. It is recommended to adopt three shifts in a day with 8 hours working in each shift.

5.2.7 Target Vehicle

The target vehicles for weighing at weighbridges are principally the trucks of different category that are carrying freight transport. It is necessary to weigh all empty trucks. Few empty trucks in random basis recommended to weigh to record the weight of empty truck also. The passenger buses are basically not target vehicle for vehicle weighing.

5.2.8 Handling of Overloaded Vehicle

If the vehicle is found overloaded during the weighing, the vehicle should not be released unless it pays the overloading fine as prescribed by the regulation and offload its overloaded mass. The offloading and security of offloaded mass is offender's responsibility. All the records of fining details shall update in the ALC-MIS. As for special goods (such as hydro-electric power equipment) transporting vehicle, special permission is required and it should be handled in accordance with the conditions stated in the permission certificate.

5.2.9 System Maintenance

Both weighbridge data collection system and ALC-MIS should periodically check to ensure that data collected and stored in ALC-MIS are correctly collected and stored.

5.2.10 Coordination with Other Enforcing Agencies

The effective vehicle overloading control is only possible with the close cooperation among DoTM, traffic police, truck operators and private sectors. Therefore, coordination among concerned stakeholders should maintain all the year round.

CHAPTER 6 STANDARD REQUIREMENTS FOR OPERATION AND MONITORING OF THE PRIVATE WEIGHBRIDGES

6.1 GENERAL

Axle load control requires a huge investment if it is installed nationwide. Therefore, involvement of public and private sector in axle load control is more effective and efficient. Data collected from various weighbridges should be consistent otherwise data integration is very difficult. Therefore, DoTM, as a responsible organization for axle load control, should have a standard requirement for all the weighbridges to be installed in the entire nation regardless whether they are operated by public or private sector. Since more than one private sector may involve in weighbridge installation, operation and management, DoTM should develop a standard requirement for operation and management of the private weighbridges. This standard requirement prepared by DoTM should strictly use in monitoring of weighbridges operated and managed by both public and private sector.

(1) Data Accuracy and Calibration

Accurate and credible data is necessary for effective implementation and enforcement of axle load control measures. Accuracy of data depends on various factors including data measuring equipment also. Therefore, regular calibration of existing weighbridges run by the private sector is an important element in axle load control. A regular routine calibration schedule must be maintained and strictly followed. The data provided by such weighbridges must be regularly monitored and their accuracy ascertained.

(2) Data Consistency

The consistency of data provided by various weighbridges run by the private sector is another vital element. There should be a system of checking the data provided by the different weighbridge stations regularly. The inconsistency if any should be rectified and regularized.

(3) Data Management System

In fact, management and storing the data is yet another activity that requires special attention. As a part of present study a web-based Axle Load Control – Management Information System (ALC-MIS) management is recommended to provide workable solution in this respect. The details of ALC-MIS are provided under task B-7 of this study. The management of axle load control related data are explained in ALC-MIS.

(4) Monitoring System

Regular monitoring of the axle load control makes the system effective and monitoring indicators are to be well defined and the outcomes recorded in regular basis. The monitoring indicators should be pre-defined and their achievement levels are recorded and discrepancies

occurring can be rectified and corrected in successive operations. It is recommended to DoTM to carry out unscheduled vehicle overloading check in random locations and time in order to improve the effectiveness of vehicle overloading control in the entire road network.

Since weighbridges are mechanical equipment, its performance and accuracy may deteriorate over the time due to repeated loading on the load cells. Therefore, monitoring of weighbridge accuracy should also be a part of DoTM's monitoring mandates. Also, data collection and analysis system shall also monitor regularly.

CHAPTER 7 TRAINING OF WEIGHBRIDGE PERSONNEL

7.1 INTRODUCTION

In order to implement the overload control in country like Nepal, a crew of well trained personnel regarding the implementation process of weighbridge stations would be most vital. At present it seems that no such personnel are available within the DoTM. The requirement of training should consider the factors like the type of weighing scales that are to be installed, the volume of freight vehicles that are to be weighed, record keeping and analysis of data obtained from such stations. In absence of the well trained personnel the endeavors of controlling the overload would not be efficient and effective, although simple to sophisticated weighing scales were installed, appropriate legislations and regulations were put in order etc.

7.2 TRAINING REQUIREMENTS

Attempts are made in these guidelines to train the required personnel in running the operations of weighbridges for controlling the overloading on the commercial vehicles in general and freight vehicles in particular. The main purpose of these guidelines is to provide the guidance for the personnel involved in controlling the overloading considering the aspects associated with various activities that are to be carried out during the implementation of the overload control. However, such training would provide general guidelines only and they are to be customized according to the specific types of overloading devices that are to be installed or to be operated.

In order to devise a training program, the following points are to be taken into considerations:

- Existing and proposed legislations and guidelines in the country in the area of vehicle overloading;
- An understanding of the vehicle loading and enforcement of vehicle loading limits;
- The practice of loading the vehicles and driving practices;
- Vehicle weighing procedures and practice;
- Establishment training facilities;
- To ensure the adequate level of expertise and professionalism;
- Harmonization and coordination of human resource development of the DoTM;
- On-the-job practical training, etc.

7.3 CURRENT AND PROPOSED TRAINING ARRANGEMENTS

Currently, there does not exist a training program in the area of overload control within DoTM although FTTEN is managing and operating a number of weighbridges in the country. The personnel who are involved in weighing the vehicles are being trained for a particular type of weighing scale installed in a particular place and as such it seems that there is no centralized or harmonized training has been conducted. It means the personnel involved in weighbridge stations have not got the desired level of training in terms of quality and expertise and no formal

consistent sort of curriculum has been followed. While talking about the training the following vital points are to be given due considerations:

- Provision of a permanent training facility within the jurisdictions of DoTM;
- Designing and devising an appropriate syllabus comprehensively;
- Achievement of consistent result during operation;
- Updating the training facilities as time passed by in accordance with the requirements;
- Monitoring the outcomes in a periodic basis.

Thus, it is apparent from above that there is no such training facility available within the country and a new facility in this area has to be established.

7.4 SCOPE OF TRAINING PROGRAM

In order to cover the multi-faceted aspects of overload control, the scopes of training should cover the following:

- Existing transport system;
- Applicable law, legislation and regulations;
- Weighbridge equipment;
- Weighing operations
- Software associated and its operation;
- Data collection and management
- Reporting and data transformation;
- Personnel management;
- Operation management;
- Maintenance and maintenance management and
- Safety.

7.4.1 Type of Personnel to be trained

In consideration to the above activities the personnel involved are of various disciplines and specializations. Weighbridge personnel can be categorized and they should receive specific training according to the disciplines to which they belong. Functionally the weighbridge personnel can be broadly categorized as:

- Law enforcing personnel;
- Operation personnel;
- Administrative personnel;
- Maintenance personnel and
- Management personnel.

7.4.2 Training Approach

The weighbridge personnel should be conversant to all of the above aspects and they are required to get the specific training for overload control as well as generic aspects of overloading mechanisms. The training should cover both the theoretical as well as practical aspects as on-the-job training. As far as practically possible, practical training should be in an established weighbridge place. For the time being for the purpose of training, the facilities established by the FTTEN can be utilized by making special arrangements with them until such facilities are not established by DoTM itself.

7.5 TRAINING SYLLABUS

The following course modules are recommended to be conducted against trainees indicated in the course. The duration of the length of the course is indicated but actual duration may vary during the course of the trainings.

TRAINING COURSE: 1		
Training Title	:	Transport and Overloading
Training Duration	:	1 Day
Target Group	:	All Staff Associated with Axle Load Control
Training Objectives	:	To understand the transport through road and the importance of overload control
Contents	:	▪ Introduction of the training ▪ Importance of transport sector in the economy of the country ▪ Importance of road network in the country for economic development and social welfare ▪ Types of road in the country and the basic principal in road design ▪ What is overloading ▪ Effects of overloads on the road and its structures (eg bridges) ▪ Effects of overloads on road safety ▪ Why overload is done
TRAINING COURSE:2		
Training Title	:	Existing Legal Framework
Training Duration	:	3 Days
Target Group	:	DoTM staff associated with overload control and Traffic Police
Training Objectives	:	▪ To impart knowledge of the existing overload control Acts, regulations and directives including definitions and terminologies.

		▪ To understand the various clauses of the Acts, regulations and directives. ▪ To make assessments of the overload fines with the help of existing clauses of the above documents.
Contents	:	▪ Terminologies and definitions used in terms of overload control in the existing Acts, regulations and directives ▪ The applicable clauses of Acts, regulations and directives in relation to overload control ▪ The powers of enforcing agencies ▪ Prosecution and administrative process ▪ Court cases · Functioning of court · Criminal procedures and evidences · Giving evidence in a court of law · Arrest procedure ▪ Handling of properties of accused after arrest ▪ Various information regarding overload control, legal axle limits and their display in the board to the vehicles ▪ Tolerance margin
TRAINING COURSE: 3		
Training Title	:	Weighbridge Operations
Training Duration	:	2 Days
Target Group	:	DoTM staff associated with overload control and Traffic Police
Training Objectives	:	To provide a detailed knowledge about the weighbridge operation in a systematic and step by step way in order to achieve the consistency in the process of overloading control particularly in freight vehicles.
Content	:	▪ Selection of vehicles for weighing · Selection criteria · Representation of type of vehicles · Pre-set sampling · Visual sampling ▪ Diversion of vehicles for weighing by traffic police ▪ Weighing operation involved in a particular type of weighbridge ▪ Determination of gross vehicle weight GVW and axle load (AL) ▪ Vehicle weighing procedure ▪ Determination of overloads

		▪ Computer displays and print out of vehicle weighing ▪ Maximum allowable mass for a particular type of freight vehicle ▪ Overload fine structures ▪ Maximum vehicle dimensions ▪ Tolerance limit in overloads ▪ Vehicles let to go within the limits ▪ Actions against the overloaded vehicles · Warning the vehicles with overloads within the tolerance limit · Imposing fine to the overloaded vehicles · Load readjustment to the overloaded vehicles · Arresting the driver for severely loaded vehicles · Seizing the vehicles for severely overloaded vehicles ▪ Exceptions on the overloads · Petroleum tankers · LPG tankers · Animals · Others: Sealed containers, perishable goods, hazardous materials etc. ▪ Abnormal loads ▪ Abnormal dimensions, abnormal mass and the permit for such dimensions and mass
TRAINING COURSE:4		
Training Title	:	Software in Overload Control
Training Duration	:	3 Days
Target Group	:	DoTM staff associated with overload control (both operational and administrative) and Traffic Police
Training Objectives	:	To impart knowledge to the DOTM operational and administrative staff and traffic police on the soft wares used in overload control
Content	:	▪ Basic computer skill ▪ Windows or other operating system ▪ Weighing software ▪ Opening weighing software ▪ System associated with the software to be used ▪ Menu and its selection ▪ Starting weighing ▪ Data capturing

		▪ Capturing mass ▪ Interpretation of results ▪ Printing weigh slips ▪ Maintenance of the software as recommended by the manufacturer of the weighbridge ▪ Report preparation, data storing and extraction of data as and when required.
TRAINING COURSE:5		
Training Title	:	Weighbridge Equipment Training
Training Duration	:	2 Days
Target Group	:	DoTM staff associated with overload control and Traffic Police
Training Objectives	:	DoTM staff associated with overload control and Traffic Police Training Objectives: To impart knowledge to the DOTM operational staff and traffic police on use, test and maintenance of weighing equipment
Content	:	Types of weighing equipment ▪ Fixed weighbridges • Mobile weighbridges • Static weighing • Dynamic weighing • Axle scales • Axle unit scales • Multi-deck scales • Calibration and maintenance • Application of Standards • Routine maintenance • Verifications • Approvals • Cleaning • Certifications to the operators ▪ Portable weighing machines • Types of equipment • Limitation of using the machine • Site selection • Setting-up procedure • Verification • Weighing procedure • Maintenance • Regular calibration and verification

TRAINING COURSE:6		
Training Title	:	Data Management and Reporting
Training Duration	:	5 Days
Target Group	:	DoTM administrative staff associated with overload control
Training Objectives	:	To impart knowledge to the DoTM administrative staff for data management and reporting
Content	:	▪ Introduction of database ▪ Data collection ▪ Data preserving and back-ups ▪ Verification of data ▪ Identification of invalid data ▪ Updating the invalid data ▪ Data analysis ▪ Reporting of data ▪ Report preparation ▪ Operational reports ▪ Manual reports ▪ Daily, weekly, monthly and annual reports ▪ Report production ▪ Interpretation of reports ▪ Graphs ▪ Interpretation of graphs ▪ Ad-hoc reports
TRAINING COURSE:7		
Training Title	:	Generic Training
Training Duration	:	1 Day
Target Group	:	All DoTM staff
Objectives	:	To impart general training for the operation and management of a weighing facility
Content	:	▪ Basic computer training ▪ Computer operation on office applications spread sheets, word processing, database and presentation ▪ Staff management ▪ Operation management ▪ Maintenance management ▪ Financial management ▪ Safety ▪ Hazardous cargos ▪ Fire fighting ▪ First aid

TRAINING COURSE: 8		
Training Title	:	Health and Safety
Training Duration	:	1 Day
Target Group	:	DoTM staff associated with axle load control and traffic police
Objectives	:	To impart general training in health and safety issues
Content	:	▪ Role of Transport Acts, regulations and directives for drivers and transport organizations involved in the transport of the following goods: ▪ Hazardous goods ▪ Hazardous wet cargo ▪ Livestock ▪ Abnormal goods