ISSUE - II

HTOA Publication

HEAVY HAULERS

FIRST HEAVY LIFT JOURNAL OF INDIA

May, 2015

INAUGURATION CEREMONY

ONLINE APPROVAL FACILITY FOR MOVEMENT OF OD/OWC ON HYDRAULIC AXLE TRAILER

HTOA Hydraulic Trailer Owners Association

नितिन गडकरी
NITIN GADKARI

मंत्री सड़क परिवहन राजमार्ग एवं पोत परिवहन
भारत सरकार,
परिवहन भवन, नई दिल्ली-110 001
MINISTER OF ROAD TRANSPORT
HIGHWAYS & SHIPPING
GOVERNMENT OF INDIA
PARIVAHAN BHAVAN, NEW DELHI-110 001

Dated 20th May, 2015

Message

I congratulate my entire team at Ministry, NHAI & appreciate the sefforts of HTOA in promoting Government's vision of "Ease of doing Business in India" through successful implementation of online approval facility for movement of OD/OWC under single window system from origin to destination.

It gives immense pleasure in conveying that app. 1200 permissions have been granted on real-time basis in just 100 days resulting in timely movement of app.120000 MT project cargo worth over INR 24 billion with no loss of time waiting for approvals and thus saving our precious resources.

The portal has established that minimizing physical interface is a credible way to bring transparency and fairness in sanction of approvals and also given a clear road map for road infra planning in a phased manner for smooth, faster & safer movement of OD/OW cargo.

It also heralds a new era of Ease of Doing Business in India and should inspire confidence in global investors who have been keen on setting up shop in India but deterred by cumbersome procedures of doing business here.

The OD/OWC movement information will give roadmap to our another landmark initiative to implement online Bridge Management System in near future and also will help in execution priority.

I am glad to know that HTOA have planned for regular publication of "Heavy Haulers" which will act as a interface for sharing of information amongst all stakeholders.

Best wishes.

Yours

(Nitin Gadkari)

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April 8, 2015

Congratulations to H.T.O.A. on a landmark achievement in setting up a common platform to address the issues and reflect the aspirations of companies engaged in ODC/OWC movement in India in close co-ordination with Government.

Efficient material transport is the lifeline of economy. L&T has a track record of manufacturing some of the largest equipment ever made in India - and occasionally, the world. Integral to our delivery schedules is transportation that is safe and dependable. I am very happy that H.T.O.A. has streamlined operations, overcome many hurdles of the past and will bring about the sense of oneness essential for progress.

India is reviving up for growth, under a dispensation that is creating an environment for development. The mega projects of the future will need mega sized equipment which in turn will call for effective transportation. I trust that H.T.O.A members will measure up to the challenge.

My commendations on the inaugural issue of *Heavy Haulers*, and my best wishes to a vibrant new communication medium within the fraternity.

K. Venkataramanan
CEO & Managing Director
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contents

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Hydraulic Trailer Owners Association

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It was a matter of great honour for each one of us at HTOA on 6th January 2015 hosting Inauguration ceremony of Ministry of Road Transport & Highways web portal for online approval facility for movement of over dimensional & over weight equipment by modular hydraulic axle trailer under single window system from origin to destination by Shri. Nitin Jairam Gadkari, Union Minister of Road Transport Highways & Shipping, Government of India at Hotel Le Meridien, New Delhi & unveiling of inaugural edition of "HEAVYHAULERS" in the august presence of:

a. Shri.Piyush Goyal, Minister of Power, New & Renewable Energy

b. Shri Vijay Chhibber, Secretary, MoRTH

c. Shri. B.P.Rao, CMD, BHEL

d. Shri. Vishnu Agarwal, Chairman, IEEMA

e. Shri.Kamal Bali, MD, VOLVO Trucks India

f. Distinguished Dignitaries, Government officials, Industry leaders, Vehicle Manufacturers, Hydraulic Trailer manufacturers, operator members, Guests & Friends from across the globe.

HTOA started its journey just few years back in 2007 with a clear objective of bringing transparency in movement of OD/OWC over modular hydraulic trailer & implementation of global safe practices in such movements and we today feel proud to announce that we have been able to move forward to our objective to a great extent with valued support from the Government.

HTOA expressed its concern on Road Safety and drew attention of Ministry towards overloading of trucks which is a nightmare in our road transport system and one of the major cause of road accidents. Today we can boldly say that with due recognition given to different hydraulic Trailer loading arrangements by the Government & IRC codes, we have a system which can eradicate overloading on Indian Roads in true sense. As hydraulic trailers move at a very low speed they can be termed as the safest commercial vehicle on Indian roads if one compares the vehicle type accident data. The worry on date is not the Gross vehicle weight but it is

the laden axle weight. The real worry is the dimensional norms being flouted by light weight cargo carrying closed vehicles like FMCG, electronics, automobiles who move at very high speeds and cause a direct threat to Road safety succumbing to pressures of manufacturers to reduce per unit freight cost as such manufacturers have least concern over value of human life lost in accidents.

HTOA requested Hon'ble Minister to take a note on the issue and ensure that strict action is taken against users of such illegally built trucks apart from the truck owners.

HTOA felt that only remedy to fill such gaps in system was a direct interaction between the real users i.e. the large equipment manufacturers and the regulators of Law i.e. Ministry.

It was for the first time that Ministry in close co-ordination with HTOA held a full day seminar on Heavy Transport in India in multiple sessions with participants from Ministry, leading large industrial houses, hydraulic trailer operators, bridge engineers and many other key stakeholders.

"Modular Hydraulic Trailer- A must to achieve Make in India vision getting true"

Chaired by:

Shri. Vijay Chhibber
Secretary

Ministry of Road Transport & Highways
Government of India

"Global Transport Technologies- A boon for Road Safety"

Chaired by:

Shri Sanjay Bandopadhyaya
Joint secretary – Transport,

Ministry of Road Transport & Highways
Government of India

"Road Map of data collected through web portal for future infrastructure planning"

Chaired by:

Shri S. N. Das
Director General & Special Secretary,

Ministry of Road Transport & Highways
Government of India

The same is supported by the fact that:

i) CMVR, 1989 has been amended vide G.SR.212 (E) dt. 20/03/15 for inclusion of Puller Tractor & Modular Hydraulic Trailer.

ii) App. 2300 movement permissions have been granted by the Ministry in the past short period of nine months.

iii) Ministry recognized the importance & necessity of

ODC/OWC movement for infrastructural development in our Nation and thereby established a procedure for time bound grant of movement permissions under single window system against collection of fee covering the risk to road & bridge structures, if any due to such movements.

We feel pleasure in conveying that post 6th January 2015 all movements up to HT3 category with GCW up to 169 MT are moving without any loss of time awaiting permissions which has led to drastic reduction in transit time and a major shift in curbing overloading of trucks in movement of indivisible equipment's. It is important to mention that more than 1000 permissions have been granted online on real time basis through the Ministry's portal. The major segments enjoying the fruits are metro coaches, wind energy, power sector & cranes etc.

HTOA conveyed thanks for the relentless efforts made by the Ministry under the able guidance of Shri.Vijay Chhibber, Secretary-RTH, Shri.Sanjay Bandopadhyaya, Joint Secretary-T, Shri Alkesh Sharma, Joint Secretary & Shri.S.N.Das, Director General Road Development & SS, Shri.A.P.Pathak, CE-Bridges(S&R), Shri.A.K.Pandey, SE-Bridges alongwith entire team at Ministry.

HTOA conveyed regards to Shri.V.L.Patanker, Retd. DGRD&SS, MoRTH who has been a driving force for recognition of HT loadings by the Government.

HTOA feel it as a start of growth story for India becoming a developed Nation. All stakeholders constantly need to work hard under co-ordination with each other as a team for much more improvements in coming days.

Few forthcoming tasks are:

a. Formation of 24x7 control room for registration & time-bound redressal of grievances, if any in movement of OD/OWC by modular hydraulic trailer.

b. All HT movements be covered under online web portal system.

c. Inclusion of necessary clear provisions which are practically enforceable for such OD/OWC movements in New Road Transport & Safety Bill, 2014.

d. Design & construction of bridges on Highways as per new codes for higher GVW under HT loading arrangements.

e. Public display of complete bridge details as being asked in Ministry's Order dated 24th January 2013.

f. Identification of frequently used corridors for OD/OWC movements and up-gradation of infra structure to the desired level on such routes to make them free ways for such movements.

g. Promotion & development of facilities on waterways for OD/OWC movements.

Jai Hind

Executive Summary Report

About the inauguration and launch event of online permission facility for movement of Over Dimensional/Over Weight cargo by modular hydraulic trailers on January 6, 2015, New Delhi

Organized By:

Ministry of Road Transport and Highways **&** Hydraulic Trailer Owners Association

1 Inaugural and Launch Session:

Shri Manish Kataria, Chairman, Hydraulic Trailers Owners Association

"As hydraulic trailers move at a very low speed, they can be termed as the safest commercial vehicle on the Indian roads if one compares the vehicle type accidental data. The worry on date is not the gross vehicle weight but laden axle weight which is the main cause of worry. "

Shri B P Rao, CMD, BHEL

"It is necessary for the country to put in place regulations to facilitate & develop infrastructure for movement of such consignments with ease under safe environment."

Shri Vishnu Agarwal, Chairman, IEEMA

"You have a plethora of laws which say anything weighing more than 99 tonnes cannot be transported. BP Rao just mentioned you have 300 tonne equipment. It is heartening to know that the country lost two major equipment before we woke up. "

Shri Vijay Chibber, Secretary, Ministry of Road Transport and Highways said

"Free movement of goods and services is the essence of the modern economy. We can't have Make in India unless we have safe and rapid transportation system. And this initiative being taken today will take us a step forward."

Shri Piyush Goyal , Minister for coal, Power and Renewable Energy

"When we were talking of 'Make in India' initiative, I remember Rao Ji got up to say but it takes me nine months transporting one equipment. So how do you expect me to be competitive in pricing and how do you expect me to deliver on time?"

Shri Nitin Gadkari , Union Minister for Road Transport and Highways

"We will definitely provide that states should also make arrangements at par with the Centre to facilitate movement of heavy cargos and approval should come in a time-bound manner. If approval does not come on time, it will be deemed sanctioned so that you don't have to worry about delay."

2 Modular Hydraulic Trailer - A must to achieve "Make in India" vision getting true" session

Shri.Vijay Chhibber, Secretary, MoRTH

"The sooner we transform traditional modes of transportation into hydraulic trailers, the better," Chibber said. He added, better because it is safe and right thing to do. It also ensures that road assets and bridge assets do not get degraded in an unintended manner."

Shri. Harsh Dhingra, Bombardier

"The company was given commitment by hydraulic trailer owners to deliver consignments to Delhi within 15 days compared with 44-45 days usually taken by the railway."

Shri. BML Garg, Consultant, Wind Power Sector

"Wind industry started making machines of 55 kilowatt. Now we are making machines of 2.5 MW. We have critical components like blades and towers. Length of blade has gone from 10 meters to 55 meters. So we have to have expandable trailers for carrying these blades."

3 Global Transport Technologies – A boon for road safety" session

Shri. Sanjay Bandopadhyaya, Joint Secretary-Transport, MoRTH

"As far as roads are concerned, overloading may reduce their design life, it may immediately damage roads. As far as bridges are concerned, either you are making it or you are breaking it. That is a very serious thing." Overloading for bridges is violation of axle load limits."

Shri. J P Martin, Asia Pacific Representative, Goldhofer

"When I see in some countries like US and Australia trailers can travel at 80-90 km/hour speed. Here I think in India if ODC team succeeds in covering 150 km in a day, they will make a party at the end of the day."

Shri. A. S. Ramarao, Volvo

"The reason: most of the accidents are for more than one reason (it is not because of truck or driver but a mix of both)."

4 Road Map of Data collected through web portal for future infrastructure planning

Shri. S. N. Das, Director General-Road development & Spl.Secretary, MoRTH

"Monitoring of the movement of hydraulic trailers can be done to know their movement status, potential problems incurred in route, congestion problem & constraints in OD/OWC movement" he added."

Shri. A. P. Pathak, CE-Bridges, MoRTH

"We are going to rate the bridges also. All that information will be collected, aligned and that can be utilized for our future planning."

Shri. G. L. Verma, TBGE

"Request to Ministry of Transport and Highways is that they should design the format of the bridge management system before going for condition survey. If they finalize the format then data will be immediately be put into the bridge management system. Another important part is inspection and maintenance of the bridges."

Vote of Thanks was delivered

by Shri. A. K. Pandey, SE-Bridges-MoRTH

Speaking on the occasion he said, HTOA has acted as an extended arm of Ministry in bringing to its notice a very important area of movement of OD/OWC which is of prime importance for National growth. Today one can say that we have a road map ahead for planning of future road & bridge infra planning based on due identification

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- DYNAFLEET ONLINE - 'FUEL AND ENVIRONMENT' SERVICE

PRODUCTIVITY

- HIGH LOAD CARRYING CAPACITY – APPROVED FOR GROSS COMBINATION WEIGHT OF 200 TONNES

The Volvo FH has been the icon of Volvo Trucks for over 20 years globally. It's no mean task at that. After twenty years of patronage and global adulation, it was time to relook, rework and redefine the image. That's what we did – we worked on the new FH for you, right from the scratch. When we look at the FH now, it looks completely different, however make no mistake it's still a Volvo FH that you are looking at. Only more rugged, efficient and reliable.

A very distinct identity Asok George and his team who worked on the exteriors had only one priority; that is to give the Volvo FH a distinctive edge. It began with an upright cabin and streamlined windscreen which makes the cabin roomier. The lines of the cabin are fluid giving an impression of a truck leaning forward with its wheels pressing the ground, rearing to go. This restless energy is further complemented with the flowing graphics on the upper edge of the mud guard flaring forwards and downwards; that emphasize the aerodynamics.

A roomy workplace At Volvo, we care about people. Everyone likes to have their own space and this is emphasized in the cabin design. The upright A-pillars make the cabin more spacious, making it an inviting place where drivers would enjoy their work. The windscreen is larger, curving towards the A-pillar, giving a feeling of space. The cab has a high ceiling to further enhance the high overhead space, along with a sky roof, which doubles up as an emergency exit.

No matter how powerful the truck is, it rises to its full potential only when it is in able hands - and able hands work better when the workplace is comfortable. Every element in the cabin is designed with the driver in mind. The curved dash is not only appealing, but has an ergonomic and comfortable driving position. Buttons, controls, storage all are within easy reach. Sitting behind the wheel for long hours can be stressful in cramped spaces, so we have cushioned the seat even more with stronger lateral support and ample leg space. Passenger side mirrors are electrically controlled, so that driver doesn't have to get up and everything is at his fingertips. Should the driver need to take a break while the co-driver handles the assignment, there is a wide lower bunk where he can stretch out for a comfortable rest.

Making it count where it matters. The Volvo FH is not only about looks and comfort. It is a long term player. The front axle has load bearing certified for upto 10 tonnes and the rear tandem axle and bogie suspension is designed to handle upto 33 tonnes, making it an obvious choice to take on bigger and heavier assignments with ease. It is now technically rated for GCW of 200 MT when coupled to suitable hydraulic axle trailer; a 33% increase from the classic version. While the exteriors look elegant, the bodyline is robust with a 520 HP engine and a matched transmission delivering the best-in-class efficiency.

The Volvo FH keeps the driver updated with the Dynafleet Online 'Fuel & Environment' and 'Positioning' services. It provides information regarding vehicles performance and location, for better control on the fleet and take required action to improve their operational efficiency. To sum it up the Volvo FH still remains the flagship model, which transcends its own benchmark time after time and maintains its position of being the most powerful truck on the Indian roads.

PRODUCT FEATURES

- Distinguished exterior – Upright A-pillar, dynamic forward sloping design
- Bigger and brighter inside – Upright A-pillar, bigger windshield and side windows, unique roof hatch
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- High load carrying capacity – Technically approved for 200 MT of GCW
- New 10 tonnes front axle, New 33 tonnes rear tandem axle
- New 12x24 Tyre size for superior road grip and avoid tyre slippage under heavy loads
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- Dynaflee Online – 'Fuel & Environment' and 'Positioning' services

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photo gallery

photo gallery

No. RT-11042/13/2008-MVL
Government of India
Ministry of Road Transport & Highways

Transport Bhawan,
1, Parliament Street,
New Delhi -110001.
Dated 18th March, 2015.

To

Principal Secretaries/Secretaries/Transport Commissioners of all the States/UT Administrations.

Sub: Movement of Over-Weight and Over-Dimensional consignments (OWCs/ODCs).

Sir,

Please refer to this Ministry's letters of even number dated 30th September, 2013 and 10th October, 2013 regarding grant of permission for movement of Over-Weight and Over-Dimensional Consignments (OWCs/ODCs) as per letter No.RT-11042/13/2008-MVL dated 3rd September, 2008 and letter No.RT-11042/13/2008-MVL dated 22nd January, 2010.

2. In this regard, this is to inform that considering importance of such movements for infrastructural growth and timely completion of projects, Ministry has launched web-portal (https://morth-owc.nic.in) for online grant of movement permissions to hydraulic trailers carrying ODC/OWC under single window system from origin to destination. The procedure has been laid down in Ministry's letter No.RW-NH-35072-1-2010-D&R (B) dated 24.01.2013 read with letter No.RW-NH-35072-1-2010-S&R (B) dated 20.05.2014 and Chief Engineer [Bridges(S&R)] at Ministry has been declared as Nodal officer for this purpose.

3. As per the present system, for movement of ODCs/OWCs by hydraulic trailers on all National Highways, the powers delegated to the State Transport Commissioners for granting one trip permission for movement of hydraulic trailers in the State on the National Highways stands withdrawn pending completion of Condition Survey and the trailer shall move as per permission granted by Chief Engineer (Bridges), Ministry of Road Transport and Highways, who is the nodal officer in the Ministry as per the letter dated 20.05.2014.

4. The above procedure has eased the movement of OWCs/ODCs on National Highways. However, they are facing delay in getting permissions and other hindrances on their movements on the State Highways. In order to facilitate smooth movement of the OWCs/ODCS on the State Highways, the State Governments are requested to take necessary action to ensure that the vehicle owners do not face any hindrances.

5. All the above mentioned circulars are available on Ministry's website www.morth.nic.in and online permissions are also verifiable on the same.

Yours faithfully,

(Sanjay Bandopadhyaya)
Joint Secretary to the Govt. of India
Telephone: 23351061

रजिस्ट्री सं० डी० एल०-33004/99

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भारत का राजपत्र
The Gazette of India

असाधारण

EXTRAORDINARY

भाग II—खण्ड 3—उप-खण्ड (i)

PART II—Section 3—Sub-section (i)

प्राधिकार से प्रकाशित

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सड़क परिवहन और राजमार्ग मंत्रालय

अधिसूचना

नई दिल्ली, 20 मार्च, 2015

सा.का.नि. 212(अ).—केन्द्रीय मोटर यान अधिनियम, 1989 की धारा 110 की अपेक्षानुसार केन्द्रीय मोटर यान नियम, 1989 का और संशोधन करने के लिए भारत सरकार के सड़क परिवहन और राजमार्ग मंत्रालय की अधिसूचना संख्यांक 365(अ) तारीख 28 मई, 2014 द्वारा उन सभी व्यक्तियों से, जिनके उनसे प्रभावित होने की संभावना थी, भारत के राजपत्र, असाधारण भाग II, खंड 3, उपखंड (i) में प्रारुप नियम प्रकाशित किए गए थे, उस तारीख से जिसको उक्त अधिसूचना से युक्त राजपत्र की प्रतियां जनता को उपलब्ध करा दी गई थी, तीस दिन की अवधि के अवसान से पूर्व आक्षेप और सुझाव आमंत्रित किए गए थे;

और राजपत्र की प्रतियां जिसमें उक्त अधिसूचना प्रकाशित की गई थीं, जनता को 28 मई, 2014 को उपलब्ध करा दी गई थी;

और उक्त प्रारुप नियमों की बाबत जनता से प्राप्त आक्षेपों और सुझावों पर केंद्रीय सरकार द्वारा विचार कर लिया गया है;

अतः अब केन्द्रीय सरकार, उक्त मोटर यान अधिनियम 1988 (1988 का 59) की धारा 27, धारा 41, धारा 50, धारा 56, और उपधारा 64, धारा 88 की उपधारा 14 और धारा 110 द्वारा प्रदत्त शक्तियों का प्रयोग करते हुए, केन्द्रीय मोटर यान नियम, 1989 में निम्नलिखित और संशोधन करती है, अर्थात :—

1. (1) इन नियमों का संक्षिप्त नाम केन्द्रीय मोटर यान (चौथा संशोधन) नियम, 2015 है।

(2) इन नियमों में अन्यथा विशिष्ट रूप से उपबंधित के सिवाय, ये 1 अप्रैल, 2015 से प्रवृत्त होंगे।

1324 GI/2015

2. केन्द्रीय मोटर यान नियम 1989 (जिसे इसमें इसके पश्चात् मूल नियम कहा गया है) के नियम 2 में,—

(अ) खंड (ग) के पश्चात् निम्नलिखित खंड अंत:स्थापित किया जाएगा, अर्थात् :—

'(गक) **"संयुक्त हारवेस्टर"** से निम्नलिखित कार्यों में से एक अधिक कार्य करने के लिए डिजाइन की गई कोई मशीन अभिप्रेत है, (जो स्वत:नोदित या कृषि ट्रैक्टर, जो मुख्य संयुक्तों के लिए या मशीन के किसी अन्य संलग्नकों के लिए ट्रेलर से) या तो युग्मित या शक्तिशाली कृषि ट्रैक्टर ;

(i) छेदना, फसल काटना, गाहना, पृथक्करण करना, साफ करना, चीरना, संग्रहण करना और फसल या कृषि उत्पाद की उतराई जैसे अनाज, गन्ना, सूत चारा (पुआल या डंटल) जब खड़ी फसल या कृषि उत्पाद से होकर चलाया जा रहा है;

(ii) फसल, जो बांधी गई है, की हथलाई के लिए, इसके प्रयोग में पिकअप संलग्नक के साथ थैले का प्रबंध;

स्पष्टीकरण—इस खंड के प्रयोजन के लिए उस सड़क पर जो क्षेत्रों में और एक क्षेत्र से दूसरे क्षेत्र तक लघु अवधि के लिए तीस किलोमीटर प्रति घंटे से अधिक गति पर मुख्य रुप से आशयित उपयोग के लिए अनुषंगी है, पर चालन के लिए संयुक्त हारवेस्टर गैर परिवहन मोटर यान होगा ।

(आ) विद्यमान खंड (गक) को खंड (गकख) के रुप में पुन:संख्यांकित किया जाएगा ;

(इ) खंड (ब) के पश्चात् निम्नलिखित खंड अंत:स्थापित किए जाएंगे, अर्थात् :—

'(भ) "मॉडयूलर द्रव्यचालित ट्रैलर" से अविभाज्य भारी और अधिक लंबाई चौड़ाई वाले नौभार को खींचने के लिए आशयित और निम्नलिखित विशेषताओं वाला कोई ट्रैलर अभिप्रेत है, अर्थात् :—

(i) द्रवचालित सस्पेंशन सहित दोलन धुरियां;

(ii) स्वतंत्र रूप से परिचालनीय धुरियां;

(iii) दो या अधिक धुरी पंक्तियां;

(iv) ऐसे माड्यूलों को लंबा या तिरछा या दोनों प्रकार से जोड़ने का यथोचित विन्यास;

(v) ऐसे प्रथक्त मॉडयूलों को अंतरक बीम विन्यास के साथ या शहतीर विन्यास द्वारा या ग्रिडर ब्रिज विन्यास द्वारा जोड़ने की यथोचित व्यवस्था;

(vi) खींचे जाने या धकेले जाने के लिए उपयुक्त अगला विन्यास ।

स्पष्टीकरण : इस खंड के प्रयोजन के लिए पद,—

(I) "अंतरक बीम विन्यास" अभिव्यक्ति का अभिप्राय लंबे स्थौरा को चलाने के लिए एकल कठोर चेसिस बनाने के लिए दो पृथक्त मॉड्यूलर द्रवचालित ट्रैलर की दो पृथक्त इकाइयों को जोड़ने के लिए प्रयुक्त कठोर इस्पात चौखटे का विन्यास होगा ।

(II) "शहतीर विन्यास" अभिव्यक्ति का अभिप्राय घूमचक्कर पर आरुढ़ मॉड्यूलर द्रवचालित ट्रैलर की दो पृथक्त इकाइयों का विन्यास और नौभार का घूमचक्कर पर टिका होना होगा जिसके द्वारा इस्पात गाटर ट्रैलर चेसिस के लंबे भाग के रूप में कार्य करता है ।

(III) "ग्रिडर ब्रिज विन्यास" अभिव्यक्ति का अभिप्राय घूमचक्कर के साथ आरुढ़ मॉड्यूलर द्रवचालित ट्रैलर की दो पृथक्त इकाइयों का विन्यास और नौभार का किसी इस्पात ग्रिडर पर रखा जाना होगा, जो मॉड्यूलर द्रवचालित ट्रैलर से आरुढ़ हो, जिसके द्वारा इस्पात ग्रिडर ट्रैलर चेसिस के लंबे भाग के रूप में कार्य करता है ।

(IV) "लदाई डेक विन्यास" से घूमचक्कर के साथ में आरुढ़ माडयूलर द्रव चालित ट्रैक्टरों की पृथक इकाइयों की विन्यास अभिप्रेत है और स्थौरा लदाई डेक पर स्थापित है जो दोनों मॉड्यूलर द्रवचालित ट्रैलरों पर आरुढ़ होता है जिसके द्वारा इस्पात ग्रिडर ट्रैलर चेसिज के दीर्घ संघटक के रुप में कार्यकर्ता है ।

(vii) उपयुक्त ब्रेक प्रणाली के साथ फिट किया गया ।

(म) "खींचने वाला ट्रैक्टर" से प्रवर्ग एन3 का ऐसा बहु धुरी ट्रैक्टर अभिप्रेत है जो —

(i) मॉड्यूलर द्रवचालित ट्रैलर या उसके संयोजन के अर्गला विन्यास को नीचे से खींचने या धकेलने के लिए यथोचित विन्यास वाला हो;

(ii) कर्षण देने के लिए यथोचित स्थिर भार वाला हो;

(iii) न्यूनतम 260 एच पी (अश्व शक्ति) की शक्ति रखता हो; और

(iv) भार खींचते समय पच्चीस किलोमीटर प्रति घंटा से अनधिक अधिकतम गति वाला हो ।'

3. मूल नियमों के नियम 47 में,—

(क) उप नियम (1) में खंड (ट) के पश्चात् निम्नलिखित अंत:स्थापित किया जाएगा, अर्थात्:—

"(ठ) ऐसे तकनीकी विनिर्देश और अन्य दस्तावेज जिनकी रजिस्ट्रीकरण प्राधिकारी मॉड्यूलर द्रवचालित ट्रैलर की बाबत अपेक्षा करे";

(ख) उप नियम (2) के पश्चात् निम्नलिखित उप नियम अंत:स्थापित किया जाएगा, अर्थात् :—

(3) इन नियमों के अधीन रजिस्ट्रीकृत मॉड्यूलर द्रवचालित ट्रैलर लदी हुई स्थिति में लोक स्थान में ऐसी शर्तों के अध्यधीन चलेगा जो केन्द्रीय सरकार समय-समय पर राजपत्र में विहित करें ।

4. मूल नियमों के नियम 50 में,—

(क) "(i) उपनियम (1) के खंड (vi) में और पंरतुक के पश्चात् निम्नलिखित परंतुक अंत:स्थापित किया जाएगा अर्थात् :—

"परंतु यह भी कि संयुक्त हारवेस्टर के लिए रजिस्ट्रीकरण प्लेट का आकार 340 मिमी. × 200 मिमी. होगा और इसे अग्र भाग और संयुक्त हारवेस्टर के रियर पर दर्शित किया जाएगा और परिवहन के दौरान उपयोग की गई हैडर संयोजन के लिए ट्रेलर के पश्च पर होगा ।"

(ii) उपनियम (6) के पश्चात् निम्नलिखित उपनियम अंत:स्थापित किया जाएगा, अर्थात् :—

"(7) मॉड्यूलर द्रवचालित ट्रैलर के रजिस्ट्रीकरण चिह्न को खींचने वाले ट्रैक्टर पर प्रदर्शित नहीं किया जा सकेगा।"।

5. मूल नियमों के नियम 51 की सारणी में, क्रमसंख्यांक 9 और उससे संबंधित प्रविष्टियों के स्थान पर निम्नलिखित अंतःस्थापित किया जाएगा, अर्थात् :—

1	2	3	4	5	6
"10	संयुक्त हारवेस्टर	अग्र और पश्च अक्षर और अंक	65	10	10
11	संयुक्त हारवेस्टर के शीर्ष समुच्चय के लिए ट्रेलर	पश्च अक्षर और अंक	65	10	10।"।

6. उक्त नियमों के नियम 88 में,—

(क) उपनियम (2) के पश्चात् निम्नलिखित उपनियम अंतःस्थापित किया जाएगा, अर्थात् :—

"(2क) किसी खींचने वाले ट्रैक्टर को, जो किसी समय बिन्दु पर पंद्रह वर्ष से अधिक पुराना है, राष्ट्रीय परमिट अनुदत्त नहीं की जाएगी :

परंतु विनिर्माता द्वारा या भारत में विनिर्माता के प्रचालित न होने की दशा में चार्टर्ड इंजीनियर द्वारा अनुदत्त फिटनेस प्रमाण-पत्र के अध्यधीन राष्ट्रीय परमिट पांच वर्ष की और अवधि के लिए विस्तारित की जा सकेगी";

(ख) उपनियम (4) के पश्चात् निम्नलिखित उपनियम अंतःस्थापित किया जाएगा, अर्थात् :—

"(4क) किसी मॉड्यूलर द्रवचालित ट्रेलर के संबंध में कोई राष्ट्रीय परमिट अनुदत्त नहीं की जाएगी, जो किसी समय बिन्दु पर पच्चीस वर्ष से अधिक पुराना है, पच्चीस वर्ष की अवधि उक्त ट्रेलर के आरंभिक रजिस्ट्रीकरण की तारीख से संगणित की जाएगी :

परंतु विनिर्माता द्वारा या भारत में विनिर्माता के प्रचालित न होने की दशा में चार्टर्ड इंजीनियर द्वारा अनुदत्त फिटनेस प्रमाण-पत्र के अध्यधीन राष्ट्रीय परमिट पांच वर्ष की और अवधि के लिए विस्तारित की जा सकेगी:

परंतु यह और कि इस शर्त के अधीन रहते हुए कि प्रत्येक व्यष्टिक मॉड्यूलर द्रवचालित ट्रेलर के पास विधिमान्य राष्ट्रीय परमिट है, मॉड्यूलर द्रवचालित ट्रेलरों के संयोजन को ध्यान में न रखते हुए भारत में राष्ट्रीय परमिट विधिमान्य होगी।

स्पष्टीकरण इस धारा के प्रयोजन के लिए "राष्ट्रीय परमिट" से भारत के संपूर्ण राज्यक्षेत्र में इस धारा के अधीन मोटरयान चलाने के लिए जारी परमिट अभिप्रेत है।"

7. मूल नियमों के नियम 90 में,—

(क) "यान" शब्द के स्थान पर "ट्रेलर या मॉड्यूलर द्रवचालित ट्रेलर से भिन्न सभी मोटरयान" शब्द रखे जाएंगे;

(ख) उपनियम (2) में "ऐसे यान" शब्दों के स्थान पर "ट्रेलर या मॉड्यूलर द्रवचालित ट्रेलर से भिन्न ऐसे यान जिसके लिए यान के दोनों ओर वही सम्मिलित होगा" शब्द रखे जाएंगे;

8. मूल नियमों के नियम 93 में,—

(क) उपनियम (1क) के पश्चात् निम्नलिखित उपनियम अंतःस्थापित किया जाएगा, अर्थात् :—

"(1ख) अंतिम बिंदुओं से संलग्न अभिलंब समतों के बीच संयुक्त हारवेस्टर की धूरि के दाहिनें कोण पर संयुक्त हारवेस्टर का मापा गया सकल विस्तार 3.3 मीटर से अधिक नहीं होगा, जब वह चलती रीति में हो, और ऐसे संयुक्त हारवेस्टरों को पीली और काली जेब्रा पट्टियों द्वारा विस्तार के भाग पर पेंट किया जाएगा जो रात्रि के समय चालन के लिए अग्र और पश्च ओर सम्यक् रुप से 2.6 मीटर से अनधिक होगा और पार्किंग उपयुक्त रुप से अग्र और पश्च में लाल लैंप से युक्त होगी :

परंतु जेब्रा पट्टियों का संलग्नकों पर उपयोग करने की आवश्यकता नहीं होगी, यदि कोई है।

"(1ग) अंतिम बिंदुओं को घेरते हुए अवलंब तलों के बीच ट्रेलर के अक्ष से दायें कोण पर मापी गई मॉड्यूलर द्रवचालित ट्रेलर की कुल चौड़ाई 3 मीटर से अधिक नहीं होगी।";

(ख) उपनियम (2) में खंड (v) के पश्चात् निम्नलिखित खंड अंतःस्थापित किया जाएगा, अर्थात् :—

"(vक) तीन या अधिक धुरियों वाले खींचने वाले ट्रैक्टर की दशा में 10 मीटर ;";

"(vख) मॉड्यूलर द्रवचालित ट्रेलर, कोई एकल माडल जिसकी अधिकतम 8 धुरि पंक्तिबद्ध है, की दशा में 19 मीटर से अधिक नहीं होगी;";

(ग) उपनियम (3क) में,—

(क) "निर्माण उपकरण वाहन की कुल लंबाई" शब्दों के स्थान पर "निर्माण उपकरण वाहन और संयुक्त हारवेस्टर की कुल लंबाई" शब्द रखे जाएंगे;

(ख) विद्यमान परंतुक के पश्चात् निम्नलिखित परंतुक अंतःस्थापित किया जाएगा, अर्थात्:—

"परंतु यह और कि हारवेस्टिंग गन्ने के लिए अनन्य रुप से प्रयुक्त संयुक्त हारवेस्टर की दशा में, यात्रा में कुल लंबाई 15 मीटर से अधिक नहीं होगी।";

(घ) उपनियम (3क) के पश्चात् निम्नलिखित उपनियम अंतःस्थापित किया जाएगा, अर्थात् :—

"(3ख) खींचने वाले ट्रैक्टर और मॉड्यूलर द्रवचालित ट्रेलर संयोजन की कुल लंबाई 29 मीटर से अधिक नहीं होगी :

परंतु आठ धुरी पंक्तियों से अधिक वृहत्तर संयोजनों के कर संचलन संबद्ध प्राधिकारियों के पूर्व अनुमोदन के अध्यधीन होगा";

(ङ) उपनियम 4 में खंड (ii क)के पश्चात् निम्नलिखित अंतःस्थापित किया जाएगा, अर्थात् :—

"(iiख) मॉड्यूलर द्रवचालित ट्रेलर या ऐसे मॉड्यूलर द्रवचालित ट्रेलरों के संयोजन के मामले में 4.75 मीटर से अधिक नहीं होगी;";

(च) उपनियम (4क) में,—

(क) "निर्माण उपकरण वाहन" शब्दों के पश्चात् "या कोई संयुक्त हारवेस्टर" शब्द अंतःस्थापित किए जाएंगे ;

(ख) परंतुक में, "निर्माण उपकरण वाहन" शब्दों के पश्चात् "या कोई संयुक्त हारवेस्टर" शब्द अंतःस्थापित किए जाएंगे;

(छ) उपनियम (5) में ट्रैक्टर" शब्द के पश्चात् "या खींचने वाला ट्रैक्टर" शब्द अंतःस्थापित किए जाएंगे;

1324 GI/15-2

(ज) उपनियम (6) में "ट्रैक्टर और निर्माण उपकरण वाहन" शब्दों के स्थान पर "ट्रैक्टर, निर्माण उपकरण वाहन और संयुक्त हारवेस्टर" शब्द रखे जाएंगे;

(झ) उपनियम (6क) में "निर्माण उपकरण वाहन" शब्दों के पश्चात् "या संयुक्त हारवेस्टर" शब्द अंत:स्थापित किए जाएंगे;

(ञ) उपनियम (6क) के पश्चात् और स्पष्टीकरण से पूर्व निम्नलिखित परंतुक अंत:स्थापित किया जाएगा, अर्थात् :—

"परंतु हारवेस्टिंग गन्ने के लिए अनन्य रुप से संयुक्त हारवेस्टर की दशा में ओवरहैंग जब चलती हालत में हो तो रियर में 8.5 मीटर से अधिक नहीं होगा।";

(ख) स्पष्टीकरण में "निर्माण उपकरण वाहन" शब्दों के पश्चात् या "या संयुक्त हारवेस्टर" शब्द अंत:स्थापित किए जाएंगे।

(ट) उपनियम (7क) में, "निर्माण उपस्कर वाहन" शब्दों के पश्चात् "या संयुक्त हारवेस्टर" शब्द अंत:स्थापित किए जाएंगे।

9. मूल नियमों के नियम 94 के उपनियम (1) में, –

(क) उपनियम (1), में "कृषि ट्रैक्टर व इसके ट्रेलर" शब्दों के पश्चात् "या सयुंक्त हारवेस्टर और मॉड्यूलर द्रवचालित ट्रेलर" शब्द अंत:स्थापित किए जाएंगे;

(ख) उपनियम (2) में, "कृषि ट्रैक्टर व इसके ट्रेलर" शब्दों के पश्चात् "और सयुंक्त हारवेस्टर" शब्द अंत:स्थापित किए जाएंगे।

10. मूल नियमों के नियम 95 के उपनियम (2क) में "निर्माण उपस्कर यान" शब्दों के पश्चात् "या सयुंक्त हारवेस्टर" शब्द अंत:स्थापित किए जाएंगे।

(11) मूल नियमों के नियम 95ख के पश्चात् निम्नलिखित नियम अंत:स्थापित किया जाएगा, अर्थात् :—

"95.ग मॉड्यूलर द्रवचालित ट्रेलर के टायरों का आकार और प्लाइ - (1) रेटिंग मॉड्यूलर द्रवचालित ट्रेलरों पर उपयोग किए गए रेडियल टायर सहित टायर समय समय पर यथासंशोधित आई एस 15636: 2005 के अनुसार होंगे।

(2) मॉड्यूलर द्रवचालित ट्रेलरों की भार ले जाने की क्षमता टायर विनिर्माता द्वारा यथाविनिर्दिष्ट होगी, तथापि, मॉड्यूलर द्रवचालित ट्रेलर विनिर्माता द्वारा विनिर्दिष्ट अधिकतम भार टायर विनिर्माता द्वारा अनुज्ञात भार से अधिक नहीं होगा।

(3) मॉड्यूलर द्रवचालित ट्रेलर विनिर्माता, टायर विनिर्माता द्वारा सुझाए गए यथा अनुसंशित या अधिमानत: रिम आकारों का ही अनुरुप आई एस 9438:1980 करेगा।

टिप्पण : इस नियम के अनुपालन के लिए, कोई समतुल्य राष्ट्रीय या अंतरराष्ट्रीय मानक जैसे इंडियन स्टैण्डर्ड (आईएस), आटोमोटिव इंडस्ट्री स्टैण्डर्ड (एआईएस), ईसीई (इकोनोमिक कमीशन ऑफ यूरोप), जापान आटोमोबाइल टायर मेन्यूफेक्चर एसोसिएशन (जेएटीएमए), यूरोपियन टायर एंड रिम टेक्नीकल ऑर्गनाइजेशन (ईटीआरटीओ), दि टायर एंड रिम एसोसिएशन इंक. (टीएंडआरए), इंडियन टायर टेक्नीकल एडवाइजरी कमेटी (आईटीटीएसी), आदि को निर्दिष्ट किया जा सकेगा।

12. मूल नियमों के नियम 96 के, उपनियम (8) की सारणी के अंत में निम्नलिखित अंत:स्थापित किया जाएगा, अर्थात् :—

क्रम सं.	यान का प्रकार	भार	परीक्षण गति (वह गति जिस पर ब्रेक लगाया जाना चाहिए) (कि.मी. प्रति घंटा)	ब्रेक का प्रकार	रुकने की दूरी (मी.)
"6.	खीचने वाला ट्रेक्टर	जीवीडब्ल्यू	20	पाद प्रचालित सेवा ।	13।"।

13. मूल नियमों के नियम 96घ के पश्चात् निम्नलिखित नियम अंत:स्थापित किया जाएगा, अर्थात् :—

"96ङ. संयुक्त हारवेस्टर के लिए ब्रेक – (1) ब्रेक परीक्षण अच्छी दशा में शुष्क् स्तर की सड़क पर क्लच के प्रयोगरहित अग्र दिशा में संचालित किया जाएगा और संयुक्त हारवेस्टर की रील से संलग्न हैडर समुच्चय के साथ कर्तन बार ट्रेलर होगा"

(2) उतरे भार वाले संयुक्त हारवेस्टर की सेवा ब्रेकिंग प्रणाली जब नीचे दी गई सारणी में यथाउल्लिखित मानक परीक्षण गति पर ब्रेक का प्रयोग किया जाता है तो यथा विनिर्दिष्ट ठहराव दूरी के भीतर रुकने के लिए यान को समर्थ बनाने के लिए होगी :

सारणी

क्रम सं.	समुच्चय का प्रकार	भार (अनलोडर)	परीक्षण गति	ठहराव दूरी
1	स्व:नोदित संयुक्त हारवेस्टर	---	20 किमी./घंटा या अधिकतम गति चाहे कम हो	10 मीटर
2	संयुक्त हारवेस्टर की शक्ति से हारवेस्टर	---	24 किमी./घंटा या अधिकतम गति चाहे कम हो	10 मीटर

अधिकतम पैडल बल 600एन से अधिक नहीं होना चाहिए।"।

14. मूल नियमों के नियम 97 के उपनियम (1) में "प्रत्येक ट्रेलर" शब्दों के स्थान पर "मॉड्यूलर द्रवचालित ट्रेलर सहित प्रत्येक ट्रेलर" शब्द रखे जाएंगे।

15. मूल नियमों के नियम 98ग के पश्चात् निम्नलिखित नियम अंत:स्थापित किया जाएगा, अर्थात्:—

"98घ. संयुक्त हारवेस्टर के लिए स्टीयरिंग गियर्स - (1) हेडर असेंबली के लिए ट्रेलर से युग्मित संयुक्त हारवेस्टर का मोड निकासी चक्र व्यास, ब्रेक दशा के बिना यदि कोई है, जब समय-समय पर यथासंशोधित आईएस : 11859-2004 के अनुसार मापा जाए, 20 मीटर से अधिक नहीं होगा।

(2) संयुक्त हारवेस्टर के लिए स्टीयरिंग प्रयास अपेक्षा समय-समय पर यथासंशोधित एआईएस:042-2004 के अनुरुप ऐसे समय तक होगी जब तक तत्स्थानी बीआईएस मानक अधिसूचित नहीं हो जाते।

16. मूल नियमों के नियम 99 में, "संनिर्माण उपस्कर यान एवं कृषि ट्रैक्टर" शब्दों के स्थान पर "संनिर्माण उपस्कर यान, कृषि ट्रैक्टर और संयुक्त हारवेस्टर" शब्द रखे जाएंगे।

17. मूल नियमों के नियम 100 में, उपनियम (3क) के पश्चात् निम्नलिखित उपनियम अंतःस्थापित किया जाएगा, अर्थात् :—

"(3ख) विनिर्मित संयुक्त हारवेस्टर का अग्र विंडस्क्रीन का शीशा लैमिनेटिड सेफ्टीग्लास द्वारा विनिर्मित होंगे।"।

18. मूल नियमों के नियम 101 के, उपनियम (2क) में "सभी निर्माण उपस्कर वाहन" शब्दों के स्थान पर "सभी निर्माण उपस्कर वाहन और संयुक्त हारवेस्टर" शब्द रखे जाएंगे।

19. मूल नियमों के नियम 102 में :—

(क) उपनियम (1) में, "संनिर्माण उपस्कर यान और निर्माण उपस्कर यान" शब्द जहां जहां वे आते हैं, के पश्चात् क्रमशः "और संयुक्त हारवेस्टर" शब्द अंतःस्थापित किए जाएंगे;

(ख) उपनियम (2) के पश्चात् निम्नलिखित उपनियम अंतःस्थापित किया जाएगा, अर्थात्;

"(4) मॉड्यूलर द्रवचालित ट्रेलर की दशा में,

(i) ठहरने के लिए आशय को दो वैद्युत ठहराव लैंपों द्वारा उपदर्शित किया जाएगा जिनका रंग लाल होगा और यान के रेयर पर प्रत्येक बाईं और दाईं ओर फिट किया जाएगा ;

(ii) ठहराव लैंप खींचने वाले ट्रैक्टर के सर्विस ब्रेक नियंत्रण के प्रेरण पर दीप्तिमान किया जाएगा ;

(iii) कम से कम अंबर रंग के दो निदेश उपदर्शन फिट किए जाएंगे जिसे प्रकाश द्वारा बारी के लिए आशय उपदर्शित करने के लिए प्रदीप्तमान किया जाएगा और प्रत्येक उपदर्शन का न्यूनतम प्रदीप्तमान क्षेत्र 60 वर्ग मीटर होगा।

20. मूल नियमों के नियम 103 में उपनियम (1) और उपनियम (2) में "निर्माण उपस्कर यान" शब्दों के पश्चात् "और संयुक्त हारवेस्टर" शब्द अंतःस्थापित किए जाएंगे।

21(क) मूल नियमों के नियम 104क में,—

(क) पार्श्व शीर्षक के स्थान पर निम्नलिखित पार्श्व शीर्षक रखा जाएगा, अर्थात् :—

"104क. सनिर्माण उपस्कर यान और संयुक्त हारवेस्टरों पर परावर्तकों का फिटमेंट – सभी संनिर्माण उपस्कर यान और समुच्चय के साथ रखे जाएंगे।

(ख) खंड (i)के पश्चात् निम्नलिखित परंतुक अंतःस्थापित किया जाएगा, अर्थात् :—

"परंतु संयुक्त हारवेस्टर की दशा में, अग्र से अवरोध रहित दृष्टि के मामले में श्वेत परावर्तक प्रतिबिंब तल के ऊपर 2100 मि.मी. से अधिक नहीं होगा और व्रियान्वयन या युक्ति आने वाले वाहनों को अग्र परावर्तक प्रतिबिंब की दृश्मानता पर अवरोध नहीं डालेंगे ;";

(ग) खंड (ii) के पश्चात् निम्नलिखित परंतुक अंतःस्थापित किया जाएगा, अर्थात् :—

"परंतु संयुक्त हारवेस्टर की दशा में धरातल के ऊपर उंचाई 2100 मि.मी. से अधिक नहीं होगी;";

(घ) उपखंड (v) में "संनिर्माण उपस्कर यान" शब्दों के पश्चात् "और संयुक्त हारवेस्टर" शब्द अंतःस्थापित किए जाएंगे।

22. मूल नियमों के नियम 104ग के पश्चात् निम्नलिखित नियम अंतःस्थापित किया जाएगा, अर्थात् :—

"104घ. मॉड्यूलर द्रवचालित ट्रेलर पर परावर्तकों का फिटमेंट :—(1) प्रत्येक मॉड्यूलर द्रवचालित ट्रेलर दो परावर्तक टेपों के साथ फिट होगा जिसकी चौड़ाई रेयर और अग्र पर 50 मि.मी. से कम नहीं होगी तथा एंबर परावर्तक टेप की भारतीय मानक ब्यूरो अधिनियम, 1986 (1986 का 63) के अधीन तत्स्थानी वी आई एस विनिर्देश के अधिसूचित होने तक समय समय पर यथासंशोधित एआईएस 090: 2005 के अनुरूप पक्षों पर 50 मि.मी. से कम चौड़ाई नहीं होगी।

(2) प्रत्येक मॉड्यूलर द्रवचालित ट्रेलर दो लाल परादर्शी परावर्तक के साथ फिट होगा जिसका क्षेत्र 28.5 वर्ग मी. से कम नहीं होगा और प्रत्येक बाईं तरफ तथा पक्षों के दाहिनी ओर रियर और अग्र पर फिट होगा तथा अंबर परावर्ती परावर्तक जिसका क्षेत्र अग्र छोर पर समापन पर 28.5 वर्ग मी. से कम नहीं होगा और दूसरा सेट भारतीय मानक ब्यूरो अधिनियम, 1986 (1986 का 63) के अधीन तत्स्थानी वी आई एस विनिर्देश के अधिसूचित होने तक समय समय पर यथासंशोधित एआईएस 057 : 2005 के अनुरुप यथासंभव रियर छोर पर बंद होगा।

(3) मॉडलर द्रवचालित ट्रेलर रिथर चिन्ह प्लेट ए आई एस-089 के अनुरुप फिट की जाएगी।"।

23. मूल नियमों के नियम 105 में,—

(क) उपनियम (1) के खंड (घ) में "संनिर्माण उपस्कर यान" शब्दों के पश्चात् "और संयुक्त हारवेस्टर" शब्द रखे जाएंगे ;

(ख) उपनियम (2) के उपखंड (ii) में, "निर्माण उपकरण और निर्माण उपकरण वाहन" शब्दों के पश्चात्, जहां जहां वे आते हैं "और संयुक्त हारवेस्टर" शब्द अंतःस्थापित किए जाएंगे;

(ग) उपनियम (3क) के पश्चात् निम्नलिखित उपनियम अंतःस्थापित किया जाएगा, अर्थात् :—

"(3ख) संयुक्त हारवेस्टर के सभी आवश्यक अग्र हैड लैंप यथाशक्ति एक ही शक्ति के होंगे, सभी अनिवार्य हैं और ऐसी उंचाई पर लगे होंगे जिससे कि सामने का दृश्य स्पष्ट दिखाई दें और सामने से आने वाले यातायात के उपकरण या संयोजन का अंतिम सिरा स्पष्ट रूप से दिखाई दे।";

(घ) उपनियम (8क) के पश्चात् निम्नलिखित उपनियम अंतःस्थापित किया जाएगा, अर्थात् :—

"(8ख) प्रत्येक संयुक्त हारवेस्टर पीछे की तरफ प्रकाश में लगे हुए, जब वाहन रिवर्स गियर में चलाया जाता है, पीछे की तरफ दो लैंप लगाए जाएंगे और वहां एक श्रव्य चेतावनी तंत्र और प्रकाश स्वचालित होती हुई होगी जब वाहन रिवर्स गियर में चलाया जाता है श्रव्य चेतावनी तेज और प्रकाश स्वतःचालित होगा जब वाहन रिवर्स गियर में हो।"।

24. मूल नियमों के नियम 106 के उपनियम (1) में "संनिर्माण उपस्कर यान" शब्दों के पश्चात् "और संयुक्त हारवेस्टर" शब्द अंतःस्थापित किए जाएंगे ।

25. मूल नियमों के नियम 108क में ,—

(क) "पार्श्व शीर्षक" के स्थान पर निम्नलिखित पार्श्व शीर्षक रखा जाएगा, अर्थात्:—

"108क. निर्माण उपकरण वाहनों और संयुक्त हारवेस्टरों पर लाल या सफेद प्रकाश का उपयोग।";

(ख) प्रारंभिक भाग में "निर्माण उपस्कर वाहन" शब्दों के पश्चात् "और संयुक्त हारवेस्टर" शब्द अंतःस्थापित किए जाएंगे ।

26. उपनियम 108क के पश्चात् निम्नलिखित उपनियम अंतःस्थापित किया जाएगा, अर्थात् :—

1324 GI/15-3

"108ख. **खींचने वाले ट्रैक्टर** पर संकेत दीप या जलते बुझते लैंप का उपयोग—खींचने वाले ट्रैक्टर में दो संकेत दीप या जलते बुझते लैंप फिट होंगे जो केबिन के शीर्ष में अंबर प्रत्येक रंग के होंगे ।"।

27. मूल नियमों के नियम 109 में,—

(i) "प्रत्येक निर्माण उपस्कर यान और प्रत्येक मोटरयान" शब्दों के स्थान पर "प्रत्येक निर्माण उपस्कर यान, प्रत्येक संयुक्त हारवेस्टर और प्रत्येक मोटर यान" शब्द रखे जाएंगे;

(ii) "दूसरे परंतुक में निर्माण उपस्कर यान" शब्दों के पश्चात् "और संयुक्त हारवेस्टर" शब्द रखे जाएंगे ।

28. मूल नियमों के नियम 112क के पांचवें परंतुक में "निर्माण उपस्कर यान" शब्दों के पश्चात् "और संयुक्त हारवेस्टर" शब्द अंतःस्थापित किए जाएंगे ।

29. मूल नियमों के नियम 113 में "निर्माण उपस्कर यान" शब्दों के पश्चात् "और संयुक्त हारवेस्टर" शब्द अंतःस्थापित किए जाएंगे ।

30. मूल नियमों के नियम 115क में,—

(क) पार्श्व शीर्षक के स्थान पर निम्नलिखित पार्श्व शीर्षक रखा जाएगा, अर्थात् :—

"**115क. डीजल इंजन से चलने वाले कृषि ट्रेक्टरों, पावर टिलरों, संनिर्माण उपस्कर यानों और संयुक्त हारवेस्टरों से धूम्र और वाष्प का उत्सर्जन ।**";

(ख) उपनियम (1) और उपनियम (2) में "कृषि ट्रैक्टर और निर्माण उपस्कर यान" शब्दों के स्थान पर दोनों स्थानों पर जहां जहां वे आते हैं, "कृषि ट्रैक्टर संनिर्माण उपस्कर यान और संयुक्त हारवेस्टर" शब्द रखे जाएंगे;

(ग) उपनियम (6) में,—

(i) प्रारंभिक भाग में संनिर्माण उपस्कर यान शब्दों के पश्चात् "और स्वयं नोदित संयुक्त हारवेस्टर इस प्रकार विनिर्मित किए जाएंगे" शब्द अंतःस्थापित किए जाएंगे;

(ii) उक्त सारणी के टिप्पण में, संख्यांक 8 और उससे संबंधित प्रविष्टियों के पश्चात् निम्नलिखित अंतःस्थापित किया जाएगा, अर्थात् :—

"9. भारत स्टेज III (सीईवी) संनियम केंद्रीय मोटर यान (चौथा संशोधन) नियम, 2015 के प्रारंभ से ही स्वतः नोदित संयुक्त हारवेस्टर पर लागू होंगे।";

(घ) उक्त उपनियम (7) में "कृषि ट्रैक्टर" शब्दों के स्थान पर "कृषि ट्रैक्टर और कृषि ट्रैक्टर प्रचालित "संयुक्त हारवेस्टर" शब्द रखे जाएंगे ।

31. मूल नियमों के नियम 117 के उपनियम (1) के पहले परंतुक में "कृषि ट्रैक्टर" शब्दों के पश्चात् "और संयुक्त हारवेस्टर" शब्द अंतःस्थापित किए जाएंगे ।

32. मूल नियमों के नियम 119 में,—

(क) उपनियम (1)के पश्चात् निम्नलिखित उपनियम अंतःस्थापित किया जाएगा, अर्थात् :—

"(1क) विनिर्मित प्रत्येक संयुक्त हारवेस्टर एक विद्युत हार्न या भारतीय मानक ब्यूरो द्वारा विनिर्दिष्ट आईएस : 1884 1993 की अपेक्षाओं के अनुरूप अन्य युक्ति यान के चालक द्वारा प्रयोग के लिए चलाई जाएगी जो यान के पहुंचने या स्थिति की श्रव्य और पर्याप्त चेतावनी देने में समर्थ हो;

"परंतु संयुक्त हारवेस्टर के लिए हार्न संस्थापन अपेक्षा विनिर्देश जो समय-समय पर संशोधित किए जा सके, एआईएस-0115796:2008 के अनुसार होगी ।

(ख) उपनियम (2) में "कृषि ट्रैक्टर सहित मोटर यान" शब्दों के पश्चात् "और संयुक्त हारवेस्टर" शब्द अंतःस्थापित किए जाएंगे ।

33. मूल नियमों के नियम 120 में,—

(क) उपनियम (1) में "कृषि ट्रैक्टर" शब्दों के पश्चात् "और संयुक्त हारवेस्टर" शब्द अंतःस्थापित किए जाएंगे ;

(ख) उपनियम (4) के पश्चात् निम्नलिखित उपनियम अंतःस्थापित किया जाएगा, अर्थात् :—

"(5). संयुक्त हारवेस्टर की दशा में जब ध्वनि स्तर साथ खड़े रहने वाले व्यक्ति की स्थिति में आई एस 12180 (भाग 1) : 2000 के अनुसार मापा जाता है तो यह पास खड़े व्यक्ति की प्रास्थिति पर शोर स्तर आई ए एस 12180 (भाग 2) : 2000 के अनुसार मापा जाएगा :

परंतु पास खड़े व्यक्ति की प्रास्थिति पर ध्वनि स्तर प्रचालक के कर्ण स्तर पर 98 डीबी (ए) और 88 डीबी (ए) से अधिक नहीं होगा ।"।

34. मूल नियमों के नियम 121 के उपनियम (1) में "कृषि ट्रैक्टर एवं निर्माण उपस्कर यान" शब्दों के स्थान पर "कृषि ट्रैक्टर निर्माण उपस्कर यान और संयुक्त हारवेस्टर" शब्द रखे जाएंगे ;

35. मूल नियमों के नियम 122 में,—

(क) उपनियम (1क) में "कृषि ट्रैक्टर और निर्माण उपकरण यान" शब्दों के स्थान पर जहां जहां वे आते हैं, "कृषि ट्रैक्टर निर्माण उपकरण यान और संयुक्त हारवेस्टर" शब्द रखे जाएंगे;

(ख) उपनियम (1) के पश्चात् निम्नलिखित उपनियम अंतःस्थापित किया जाएगा, अर्थात् :—

"(1ख) विनिर्मित प्रत्येक संयुक्त हारवेस्टर पर उत्तकीर्ण या निक्षारित या खुदे हुए विनिर्माण के मास और वर्ष सहित पहचान संख्या प्लेट होगी:

(i)	विनिर्माण का नाम	.....
(ii)	मॉडल का नाम	.....
(iii)	चेजिस नं.	.....
(iv)	इंजन/ट्रेक्टर मेक और मॉडल	.....
(v)	इंजन क्रम सं. (स्वयं नोदित समुच्चय की दशा में)	.....
(vi)	विनिर्माण का मास और वर्ष	.....";।

36. मूल नियमों के नियम 124 में,—

(i) उपनियम (1क) के पश्चात् निम्नलिखित उपनियम अंतःस्थापित किया जाएगा, अर्थात् :—

"(1ख) मॉडयूलर द्वव्यचालित ट्रैलर में चालन संरक्षण युक्ति और पार्शिवक संरक्षण युक्ति के अधीन फिटमेंट वर्ष के संबंध में कोई अपेक्षा नहीं होगी।

(1ग) 'टी' संकेत जब कभी मॉडयूलर चालित ट्रैलरों पर उपयोग किए जाते हों तो वे आईएस : 99 42 : 1981 के अनुपालन में होंगे।"।

37. मूल नियमों के नियम 124क में,—

(क) पार्श्व शीर्षक के स्थान पर निम्नलिखित पार्श्व शीर्षक रखा जाएगा, अर्थात् :—

"124क. **"कृषि ट्रैक्टर और संयुक्त हारवेस्टरों** के लिए संघटकों के सुरक्षा मानक";

(ख) उपनियम (1) में, "कृषि ट्रैक्टर" शब्दों के पश्चात् और "संयुक्त हारवेस्टर" शब्द अंतःस्थापित किए जाएंगे;

(ग) उपनियम (2) में,— "कृषि ट्रैक्टर", और कृषि ट्रैक्टरों शब्दों के पश्चात्, जहां जहां वे आते हैं और "संयुक्त हारवेस्टर" शब्द अंतःस्थापित किए जाएंगे;

(घ) दूसरे परंतुक के पश्चात् निम्नलिखित परंतुक अंतःस्थापित किया जाएगा, अर्थात् :—

"परंतु यह भी कि संयुक्त हारवेस्टर की दशा में, यदि बाडी कार्य का आकार और प्रकार संकेत युक्तियों के संस्थापन की ऊंचाई अपेक्षा को पूरा करना असंभव हो तो यह 300 मि.मी. से अनधिक ऊंचाई पर अनुज्ञात किया जाएगा :

(i) डिप बीम हैड लाइन (संदर्भ खंड 6.2.4.2)*

(ii) अग्र दिशा सूचक लैंप (संदर्भ खंड 6.5.4.2)*

(iii) अग्र प्रास्थिति लैंप (संदर्भ खंड 6.9.4.2)*

(iv) अग्र पार्किंग लैंप (संदर्भ खंड 6.12.4.2)*

*टिप्पण—एआईएस -- 030: 2001 का संदर्भ खंड संख्यांक :

परंतु यह भी कि विनिर्मित संयुक्त हारवेस्टर का प्रकाश संकेतन और उपदर्शन प्रणालियां समय समय पर यथासंशोधित सुरक्षा मानक एआईएस : 062 - 2004 के अनुसार ऐसे समय तक तब तक नहीं होगी जब तक कि तत्स्थानी बीआईएस मानक अधिसूचित नहीं हो जाते :

परंतु यह भी कि विनिर्मित संयुक्त हारवेस्टर पर फिट रियर चेतावनी ट्रैंगल समय-समय पर यथासंशोधित उसके उपाबंध 6क के खंड 1.4.3 को छोड़कर एआईएस : 088-2005 के अनुसार ऐसे समय तक तब तक होंगे जब तक तत्स्थानी मानक अधिसूचित नहीं हो जाते।"

(ङ) मूल नियम (3), (4), (5) और (7) में "कृषि ट्रैक्टर" पश्चात् जहां-जहां वे आते हैं, "और संयुक्त हारवेस्टर" शब्द अंतःस्थापित किए जाएंगे ।

38. मूल नियमों के नियम 125क में,—

(क) पार्श्व शीर्षक के स्थान पर निम्नलिखित पार्श्व शीर्षक रखा जाएगा, अर्थात् :—

"125.क सुरक्षा बैल्ट आदि **निर्माण उपस्कर यान और संयुक्त हारवेस्टर** हेतु ।"

(ख) निम्नलिखित परंतुक अंतःस्थापित किया जाएगा, अर्थात् :—

"परंतु प्रत्येक संयुक्त हारवेस्टर में चालक के लिए सीट बैल्ट और पीछे के दृश्य के लिए एक दर्पण के साथ सज्जित केबिन फिट होगा ।"

39. मूल नियमों के नियम 126 में, "ट्रेलरों और अर्ध ट्रेलरों से भिन्न" शब्दों के स्थान पर "ट्रेलर, अर्ध ट्रेलर और माडुलर द्रवचालित ट्रेलर सहित" शब्द रखे जाएंगे ।

40. मूल नियमों के नियम 126ख में,—

(क) पार्श्व शीर्षक के स्थान पर निम्नलिखित पार्श्व शीर्षक रखा जाएगा, अर्थात् :—

"126ख. प्रत्येक निर्माण उपकरण वाहन यान और संयुक्त हारवेस्टर का मूल रुप परीक्षण के अध्यधीन होगा";

(ख) उपनियम (1) के पश्चात् निम्नलिखित परंतुक अंतःस्थापित किया जाएगा, अर्थात् :—

"(ख) केंद्रीय मोटर यान (चौथा संशोधन) नियम, 2015 के प्रारंभ होने की तारीख से ही संयुक्त हारवेस्टर का प्रत्येक विनिर्माता स्वयं द्वारा विनिर्मित किए जाने वाले संयुक्त हारवेस्टर का मूलरूप नियम 126 में निर्दिष्ट अभिकरणों में से किसी के द्वारा अधिनियम और इन नियमों के उपबंधों का अनुपालन करने के लिए उस अभिकरण द्वारा एक प्रमाणपत्र स्वीकृत किए जाने हेतु परीक्षण के लिए प्रस्तुत करेगा";

(ग) उपनियम (2) के पश्चात् निम्नलिखित उपनियम अंतःस्थापित किया जाएगा, अर्थात् :—

"(2क) नियम 126 में निर्दिष्ट परीक्षण अभिकरण केंद्रीय सरकार द्वारा अधिकथित प्रक्रिया के अनुसरण में इस बात का सत्यापन करने के लिए कि क्या संयुक्त हारवेस्टर इस अधिनियम या इसके अधीन जारी नियमों या आदेशों के उपबंधों के अनुरुप है, विनिर्माता की उत्पादन रीति से संयुक्त हारवेस्टर पर परीक्षण का संचालन करते हैं :

परंतु इस उपनियम के उपबंध किसी संयुक्त हारवेस्टर की बाबत 1 अप्रैल, 2015 सहित तब तक लागू नहीं होंगे ।"।

[फा. सं. आरटी-11042/13/2008-एमवीएल]

संजय बंदोपाध्याय, संयुक्त सचिव

टिप्पण : मूल नियम भारत के राजपत्र, असाधारण, भाग II, खंड 3, उपखंड (i) में सा.का.नि. 590(अ), तारीख 2 जून, 1989 द्वारा प्रकाशित किए गए थे और सा.का.नि. 168(अ) तारीख 3 मार्च, 2015 द्वारा अंतिम बार संशोधित किए गए थे ।

1324 GI/15-4

Goldhofer

Revolution in the SPMT segment new PST/ES-E heavy-duty modules

The new generation comprises three heavy-duty modular transporters: the PST/ES-E 6 (315) with an axle load of 45 t, the PST/ES-E (285) with electronic multiway steering and hydraulically adjustable track width, and the PST/ES-E (385), the first modular transporter with an axle load of 60 t. With a track width of 1810 mm, the PST/ES-E (285) has 24 % greater lateral stability than a conventional SPMT with a track width of 1450 mm. With a basic width of 2430 mm, it can be quickly transported to the next job and offers optimum maneuverability - with less manpower than is normally the case. The PST/ES-E (385) is designed for ultra-heavy loads and offers the optimum payload/axle load ratio – with standard truck tires. And that is one of the keys: All the new self-propelled modules can be fitted with standard low loader or truck tires in 215, 285, 315 and 385 mm widths. In addition – thanks to the +/-135° steering angle and the larger tire contact area – tire wear is significantly reduced. As drive units, there is a choice of four PowerPacks with a rated output of 150, 207, 360 and 390 kW, two of which are already in compliance with the new TIER IV Final Standard. A hybrid drive is also available as an optional. "Goldhofer's new SPMT generation is also superior to conventional SPMTs with regard to such decisive parameters as capacity, bending moment, speed and tractive force," says Horst Häfele, Sales Manager Modules. Thanks to the new drive system, travel speed has increased by between 30 and 100 %, while tractive force is up by 27.5 % and lateral stability is up to 24 % higher. "These factors and also the lower mobilization costs are a source of real added value," Häfele points out. For Stefan Fuchs, one thing is clear: "With our new PST/ES-E modules in the SPMT segment, we have proved once again that Goldhofer is the world market leader in terms of technology, quality and value retention."

MINISTRY OF ROAD TRANSPORT AND HIGHWAYS

NOTIFICATION

New Delhi, the 20th March, 2015

G.S.R. 212(E).–Whereas the draft of certain rules further to amend the Central Motor Vehicles Rules, 1989 was published, as required under sub-section (1) of section 212 of the Motor Vehicles Act, 1988 (59 of 1988) vide notification of the Government of India in the Ministry of Road Transport and Highways, number G.S.R. 365(E), dated the 28th May, 2014, in the Gazette of India, Extraordinary, Part II, section 3, sub-section (i), inviting objections and suggestions from all persons likely to be affected thereby, before expiry of the period of thirty days from the date on which copies of the Official Gazette containing the said notification were made available to the public;

And, whereas, copies of the said Official Gazette in which the said notification was published were made available to the public on the 28th May, 2014;

And, whereas, the objections and suggestions received from the public in respect on the said draft have been considered by the Central Government.

Now, therefore, in exercise of the powers conferred by sections 27,41,50,56 and 64, sub-section (14) of section 88 and section 110 of the said Motor Vehicles Act, 1988, the Central Government hereby makes the following rules further to amend the Central Motor Vehicles Rules, 1989, namely:—

1. (1) These rules may be called the Central Motor Vehicles (Fourth Amendment) Rules, 2015.

(2) Save as otherwise specifically provided in these rules, they shall come into force with effect from the 1st day of April, 2015.

2. In the Central Motor Vehicles Rules, 1989 (hereinafter referred to as the principal rules), in rule 2,—

(A) after clause (c), the following clause shall be inserted, namely:—

'(ca) "combine harvester" means an agricultural equipment vehicle, self propelled or agricultural tractor powered type (either coupled to the trailer for header assembly or any other attachment of the machine) designed to perform more than one of the following tasks namely:—

(i) picking, harvesting, threshing, separating, cleaning, chopping, collecting and unloading crop or agricultural produce, such as grain, sugarcane, cotton, fodder, straw or stalk, while moving through the standing crop or agricultural produce;

(ii) arrangement of bagging with a pick-up attachment to use it for handling crop that has been swathed.

Explanation.—For the purpose of this clause, a combine harvester shall be a non-transport motor vehicle, the driving on the road of which is incidental to the main intended use in the fields and for travelling from one field to another, for short durations, at a speed not exceeding thirty kilometre per hour;';

(B) the existing clause (ca) shall be renumbered as clause (cab);

(C) after clause (w), the following clauses shall be inserted, namely:—

'(x) "modular hydraulic trailer" means a trailer module intended for carrying indivisible heavy or over-dimensional cargo and having the following features, namely:—

(i) swing axles with hydraulic suspension;
(ii) independently steerable axles;
(iii) two or more axle rows;
(iv) suitable arrangement for joining such modules longitudinally or laterally or both;
(v) suitable provision for joining such separate modules with spacer beam arrangement or by bolster arrangement or by girder bridge arrangement or by loading deck arrangement;

(vi) suitable drawbar arrangement for being pulled or pushed or self propelled.

Explanation.—For the purpose of this clause, the expressions,—

(I) "spacer beam arrangement" shall mean the arrangement of rigid steel frame used for joining two separate modular hydraulic trailer units to form a single rigid chassis for movement of long cargo;

(II) "bolster arrangement" shall mean the arrangement of two separate units of modular hydraulic trailer mounted with turn tables and the cargo rests on the turn tables, whereby cargo structure itself acts as long member of trailer chassis;

(III) "girder bridge arrangement" shall mean the arrangement of two separate units of modular hydraulic trailers mounted with turn tables, and cargo is placed on a steel girder, which is then mounted on modular hydraulic trailer, whereby the steel girder acts as the long member of the trailer chassis;

(IV) "loading deck arrangement" shall mean the arrangement of two separate units of modular hydraulic trailers mounted with turn tables, and cargo is placed on a loading deck, which is then mounted on both modular hydraulic trailers, whereby the loading deck acts as the long member of the modular hydraulic trailer chassis;

(vii) fitted with suitable braking system.

(y) "puller tractor" means a multi-axle haulage tractor of Category N3 vehicle having-

(i) suitable arrangement to pull or push modular hydraulic trailer or combination thereof under drawbar arrangement;

(ii) adequate ballast weight for providing traction;

(iii) minimum engine power of 260 hp; and

(iv) maximum speed not exceeding twenty five kilometre per hour while pulling load;

3. In rule 47 of the principal rules,

(a) in sub-rule (1), after clause (k), the following clause shall be inserted, namely:—

"(l) technical specifications and any other document as may be required by the registering authority in respect of the modular hydraulic trailer.";

(b) after sub-rule (2), the following sub-rule shall be inserted, namely:—

(3) The modular hydraulic trailers registered under these rules shall ply in public place in laden condition subject to such other conditions as may be determined by the Central Government from time to time.".

4. In rule 50 of the principal rules,—

(a) in sub-rule(1), in clause (vi), after the second proviso, the following proviso shall be inserted, namely:—

"Provided also that the size of registration plate for combine harvester shall be 340mm X 200 mm and exhibited at the front and at the rear of combine harvester and at the rear of trailer for header assembly used during transport:";

(ii) after sub-rule (6), the following sub-rule shall be inserted, namely:—

"(7) The registration mark of the modular hydraulic trailer may not be exhibited on the puller tractor.".

5. In rule 51 of the principal rules, in the Table, after serial number 9 and the entries relating thereto, the following serial numbers and entries shall be inserted, namely:—

1	2	3	4	5	6
"10	Combine harvester	Front and rear letters and numerals	65	10	10
11	Trailer for header assembly of combine harvesters	Rear letters and numerals	65	10	10.".

6. In rule 88 of the principal rules,—

(a) after sub-rule (2), the following sub-rule shall be inserted, namely:—

"(2A) No national permit shall be granted for a puller tractor which is more than fifteen years old at any point of time:

Provided that the national permit may be extended for another period of five years subject to certificate of fitness granted by the manufacturer or a chartered engineer, in case the manufacturer ceases to operate in India.";

(b) after sub-rule (4), the following sub-rule shall be inserted, namely:—

'(4A) No national permit shall be granted in respect of a modular hydraulic trailer, which is more than twenty five years old at any point of time, the period of twenty five years being computed from the date of initial registration of the said modular hydraulic trailer:

Provided that the national permit may be extended for another period of five years subject to certificate of fitness granted by the manufacturer or a chartered engineer or approving authority, in case the manufacturer ceases to operate in India:

Provided further that the national permit shall be valid irrespective of the combination of modular hydraulic trailers subject to the condition that each individual modular hydraulic trailer is having valid national permit.

Explanation.—For the purposes of this section, "national permit" means a permit issued to ply the motor vehicle under this section, throughout the territory of India.'.

7. In rule 90 of the principal rules,—

(a) in sub-rule (1), for the words "The vehicle" the words "All motor vehicles other than a trailer or modular hydraulic trailer" shall be substituted;

(b) in sub-rule (2), for the words "such vehicle", the words "such vehicles other than a trailer or modular hydraulic trailer for which the same shall appear on both sides of the vehicle " shall be substituted.

8. In rule 93 of the principal rules,—

(a) after sub-rule (1A), the following sub-rules shall be inserted, namely:—

"(1B) The overall width of a combine harvester measured at right angles to the axis of the combine harvester between perpendicular planes enclosing the extreme points shall not exceed 3.3 meters while in the travel mode; and such combine harvesters shall be painted by yellow and black zebra stripes on the portion of the width that exceeds 2.6 meters on the front; and rear sides duly marked for night time driving and parking suitably by white or amber lamps at the front and red lamps at the rear:

Provided that the zebra stripes need not be used on attachments, if any.

(1C) The overall width of modular hydraulic trailer, measured at right angles to the axis of the modular hydraulic trailer between perpendicular planes enclosing the extreme points shall not exceed three metres.";

(b) in sub-rule (2), after clause (v), the following clause shall be inserted, namely:—

"(va) in the case of a puller tractor having three or more axles, ten meters;

(vb) in the case of a modular hydraulic trailer, any single module with maximum eight axle rows shall not exceed nineteen metres;";

(c) in sub-rule (3A),—

(A) for the words "The overall length of the construction equipment vehicle", the words "The overall length of the construction equipment vehicle and combine harvester" shall be substituted;

(B) after the existing proviso, the following proviso shall be inserted, namely:—

"Provided further that in case of combine harvester exclusively used for harvesting sugarcane, the overall length in travel shall not exceed 15 metres.";

(d) after sub-rule (3A), the following sub-rule shall be inserted, namely:—

"(3B) The overall length of puller tractor and modular hydraulic trailer combination shall not exceed 29 metres:

Provided that movement of larger combinations with more than eight axle lines shall be subject to prior approval of the concerned authorities.";

(e) in sub-rule 4, after clause (iia), the following clause shall be inserted, namely:—

"(iib) in the case of modular hydraulic trailer or combination of such modular hydraulic trailers, shall not exceed 4.75 metres;";

(f) in sub-rule (4A),—

(A) after the words "construction equipment vehicle", the words "or combine harvester" shall be inserted;

(B) in the proviso, after the words "construction equipment vehicle" the words "or combine harvester" shall be inserted;

(g) in sub-rule 5, after the words "tractor", the words "or puller tractors" shall be inserted;

(h) in sub-rule (6), for the words "tractor and construction equipment vehicle", the words "tractor, construction equipment vehicle and combine harvester" shall be substituted;

(i) in sub-rule (6A), after the words "construction equipment vehicle", the words "or combine harvester" shall be inserted;

(j) in sub-rule (6A), before the Explanation, the following proviso shall be inserted, namely:—

"Provided that in case of a combine harvester exclusively used for harvesting sugarcane, the overhang shall not exceed 8.5 meters in rear while in travel mode.";

(B) in the Explanation, in the opening portion, after the words "construction equipment vehicle", the words "or combine harvester" shall be inserted;

(k) in sub-rule (7A), after the words "construction equipment vehicle", the words "or combine harvester" shall be inserted.

9. In rule 94 of the principal rules,—

(a) in the sub-rule (1), after the words "agricultural tractor and its trailer", the words ", and combine harvester and modular hydraulic trailers" shall be inserted;

(b) in the sub-rule (2), after the words "agricultural tractor and its trailer", the words ", and the combine harvester" shall be inserted.

10. In rule 95 of the principal rules, in the sub-rule (2A), after the words "construction equipment vehicle", the words "or a combine harvester" shall be inserted.

11. After rule 95B of the principal rules, the following rules shall be inserted, namely:—

"95C. Size and ply rating of tyres for modular hydraulic trailers. – (1) The tyres including radial tyres used on modular hydraulic trailers shall be in accordance with IS 15636: 2005 as amended from time to time.

(2) The tyre of modular hydraulic trailers shall have load carrying capacity as specified by the tyre manufacturer, however, the maximum load specified by the modular hydraulic trailers manufacturer shall not be greater than that permitted by the tyre manufacturer.

(3)The modular hydraulic trailer manufacturer shall select the recommended or preferred rim sizes only, as suggested by the tyre manufacturer and the wheel rims shall confirm to IS 9438:1980.

1324 GI/15-5

Note:— For compliance to this rule, any equivalent national or international standards such as Indian Standards (IS), Automotive Industry Standard (AIS), ECE (Economic Commission of Europe), Japan Automobile Tyre Manufacturers Association (JATMA), European Tyre and Rim Technical Organisation (ETRTO), Tyre and Rim Association Inc. (TRA), Indian Tyre Technical Advisory Committee (ITT'AC), etc., may be referred.

95D. Limited road trials.—The Hydraulic Modular Trailer with specified Gross Vehicle Weight or maximum load carrying capacity shall be subjected to minimum hundred kilometers run preferably on plain roads with speed less than ten kilometres per hour.".

12. In rule 96 of the principal rules, in sub-rule (8), in the Table, after serial number five and the entries relating thereto, the following serial numbers and entries shall be inserted at the end, namely:—

S. No.	Type of vehicle	Load	Test speed (The speed at which the brake should be applied) (km/h)	Type of brake	Stopping distance (m)
"6.	Puller Tractor	GVW	20	Foot operated service.	13.".

13. After rule 96D of the principal rules, the following rule shall be inserted, namely:—

"96E. Brakes for combine harvester.—(1) The brake test shall be conducted in forwarded direction on dry hard road in good condition with the clutch disengage and cutter bar trailer with header assembly attached to reel of combine harvester.

(2) The service braking system of the unladen combine harvester shall be capable of bringing the vehicle to a halt within a specified stopping distance when brake is applied at the standard test speed as mentioned in the Table below:

TABLE

S.No.	Type of Combine	Load (Unloader)	Test Speed	Stopping Distance
1	Self Propelled Combine harvester	-	20 km/h or max speed whichever is less	10 meter
2	Tractor Powered Combine harvester	-	24 km/h or max speed whichever is less	10 meter

Maximum pedal force should not be more than 600 N.".

14. In rule 97 of the principal rules, in sub-rule (1), for the words "Every trailer", the words "Every trailer including modular hydraulic trailer" shall be substituted.

15. After rule 98C of the principal rules, the following rule shall be inserted, namely:—

"98D. Steering gears for combine harvester.—(1) The turning clearance circle diameter of combine harvester, coupled to the trailer for header assembly, if any, when measured as per IS: 11859-2004, as amended from time to time, shall not exceed 20 meters, without brake condition.

(2) The steering effort requirement of combine harvester shall conform to AIS : 042-2004, as amended from time to time, till such time the corresponding Bureau of Indian Standard is notified."

16. In rule 99 of the principal rules, for the words "construction equipment vehicle and agricultural tractor", the words "construction equipment vehicle, agricultural tractor and combine harvester" shall be substituted.

17. In rule 100 of the principal rules, after sub-rule (3A), the following sub-rule shall be inserted, namely:—

"(3B) The glass of the front wind screen of a combine harvester shall be made of laminated safety glass.".

18. In rule 101 of the principal rules, in sub-rule (2A), for the words "All construction equipment vehicles", the words "All construction equipment vehicles and combine harvesters" shall be substituted.

19. In rule 102 of the principal rules, -

(a) in sub-rule (l) for the words "construction equipment vehicles. Every construction equipment vehicle shall", the words "construction equipment vehicles and the combined harvester, and such construction equipment vehicles and combine harvester" shall be substituted;

(b) in sub-rule (2), after the words "construction equipment vehicle", the words " and the combine harvester" shall be inserted;

(c) after sub-rule (3), the following sub-rule shall be inserted, namely:—

"(4) In the case of modular hydraulic trailer,—

(i) the intention to stop shall be indicated by two electrical stop lamps which shall be red in color and shall be fitted one each on left and right hand sides at the rear of the vehicle;

(ii) the stop lamps shall light up on the actuation of the service brake control of the puller tractor;

(iii) at least two direction indicators of amber colour shall be fitted, which are illuminated to indicate intention to turn by a light and the minimum illuminated area of each indicator shall be 60 sq.cm.".

20. In rule 103 of the principal rules, in sub-rule (1) and sub-rule (2), after the words "construction equipment vehicle", the words "and combine harvester" shall respectively be inserted.

21. In rule 104A of the principal rules,—

(a) for the marginal heading and the opening portion, the following marginal heading and opening portion shall be substituted, namely:—

"104A. Fitment of reflectors on construction equipment vehicles and combine harvesters.—

All construction equipment vehicles and combine harvesters shall be fitted with-" shall be substituted;

(b) after clause (i), the following proviso shall be inserted, namely:—

"Provided that in case of combine harvester, the height of front white reflex-reflector shall not be more than 2100 mm above the ground in the case of unobstructed vision from the front and the implement or device shall not obstruct the visibility of the front reflex-reflectors to the oncoming vehicles;";

(c) after clause (ii), the following proviso shall be inserted, namely:—

"Provided that in case of combine harvester, the height shall not exceed 2100 mm above the ground;";

(d) in sub-clause (v), after the words "construction equipment vehicle", the words "and combine harvester" shall be inserted.

22. After rule 104C of the principal rules, the following rule shall be inserted, namely:—

"104D. Fitment of retro-reflective tapes or reflectors and rear marking plate on modular hydraulic trailer.—(1) Every modular hydraulic trailer shall be fitted with two red reflective tapes having width not less than 50 mm at the rear and front and amber reflective tape having width not less than 50 mm on the sides, conforming to AIS: 090:2005, as amended from time to time, till the corresponding Bureau of Indian Standard specifications are notified under the Bureau of Indian Standards Act, 1986 (63 of 1986).

(2) Every modular hydraulic trailer shall be fitted with two red reflex reflectors having area not less than 28.5 sq. cm. and shall be fitted one each on left and right hand sides at the rear and front and amber reflex reflector having area not less than 28.5 sq. cm on the sides one set as close to the front end and the other set as close to the rear end as possible, conforming to AIS:057:2005, as amended from time to time till the corresponding Bureau of Indian Standard specifications are notified under the Bureau of Indian Standards Act, 1986(63 of 1986).

(3) Every Modular hydraulic trailer shall be fitted with rear marking plate confirming to AIS-089.".

23. In rule 105 of the principal rules.-

(a) in sub-rule (1), in clause (d), after the words "construction equipment vehicle" the words "and combine harvesters" shall be inserted;

(b) in sub-rule (2), in clause (ii), after the words "construction equipment" and "construction equipment vehicle", wherever they occur, the words "and combine harvester" shall respectively be inserted;

(c) after sub-rule (3A), the following sub-rule shall be inserted, namely:—

"(3B) All the obligatory front head lamps of a combine harvester shall be as nearly as possible of the same power and fixed at a height so that front visibility is maintained and farthermost point of equipment or attachment is clearly seen by oncoming traffic.";

(d) after sub-rule (8A), the following sub-rule shall be inserted, namely:—

"(8B) Every combine harvester shall be fitted with two lamps at the rear throwing light to the rear when the vehicle is being driven in the reverse gear and there shall also be an audible warning system operating when the vehicle is in reverse gear so that the audible warning system and the light are automatically operated when the vehicle is in reverse gear.".

24. In rule 106 of the principal rules, in sub-rule (1), after the words "construction equipment vehicle", the words "and combine harvester" shall be inserted.

25. In rule 108A of the principal rules,—

(a) for the marginal heading, the following marginal heading shall be substituted, namely:—

"108A. Use of red or white light on construction equipment vehicles and combine harvesters.-";

(b) in the opening portion, after the words "construction equipment vehicle", the words "and combine harvester" shall be inserted.

26. After rule 108A, the following rule shall be inserted, namely:—

"108B. Use of beacon or blinking lamp on puller tractor.—The puller tractor shall be fitted with two beacon or blinking lamps, which are amber in color, one each on left and right hand side on top of the cabin.".

27. In rule 109 of the principal rules, -

(i) in the opening portion, for the words "Every construction equipment vehicle and every motor vehicle", the words "Every construction equipment vehicle, combine harvester and motor vehicle" shall be substituted;

(ii) in the second proviso, after the words "construction equipment vehicles", the words "and combine harvesters" shall be inserted.

28. In rule 112 of the principal rules, in the fifth proviso, after the words "construction equipment vehicle", the words "and combine harvester" shall be inserted.

29. In rule 113 of the principal rules, after the words "construction equipment vehicle", the words "and combine harvester" shall be inserted.

30. In rule 115A of the principal rules,—

(a) for the marginal heading, the following marginal heading shall be substituted, namely:—

"115A. Emission of smoke and vapour from agricultural tractors, power tillers, construction equipment vehicles and combine harvesters driven by diesel engines.-";

(b) in sub-rule (1) and sub rule (2), for the words "agricultural tractors and construction equipment vehicles" at both the places where they occur, the words "agricultural tractors, construction equipment vehicles and combine harvesters" shall be substituted;

(c) in sub-rule (6),—

(i) in the opening portion, after the words "construction equipment vehicle", the words "and self propelled combine harvester" shall be inserted;

(ii) in the Table, in the Notes, after paragraph 8, the following paragraph shall be inserted, namely:—

"9. Bharat Stage III (CEV) norms shall be applicable to self propelled combine harvester on and from the commencement of the Central Motor Vehicles (Fourth Amendment) Rules, 2015.";

(d) in sub-rule (7), for the words "agricultural tractor", the words "agricultural tractor and agricultural tractor-operated combine harvester" shall be substituted.

31. In rule 117 of the principal rules, in sub rule (1), in the first proviso, after the words "agricultural tractor", the words "and combine harvester" shall be inserted.

32. In rule 119 of the principal rules,—

(a) after sub-rule (1), the following sub-rule shall be inserted, namely:—

"(1A) Every combine harvester shall be fitted with an electric horn or other devices confirming to the requirements of IS 1884 : 1993 specified by the Bureau of Indian Standards for use by the driver of the vehicle and capable of giving audible and sufficient warning of the approach or position of the vehicle:

Provided that the horn installation requirement for combine harvester shall be as per IS 15796:2008 specification as amended from time to time.";

(b) in sub-rule (2), after the words "motor vehicle including agricultural tractor", the words "and combine harvester" shall be inserted.

33. In rule 120 of the principal rules,—

(a) in sub-rule (1), after the words "agricultural tractor", the words "and combine harvester" shall be inserted;

(b) after sub-rule (4), the following sub-rule shall be inserted, namely:—

"(5) In the case of combine harvester, the noise level at operator's ear level shall be measured as per Annex B of IS 12180 (Part-1): 2000, whereas the noise level at bystander's position shall be measured as per IS 12180 (Part-2): 2000:

Provided that the noise level shall not exceed 98 dB (A) at operator's ear level and 88 dB (A) at bystander position.".

34. In rule 121 of the principal rules, in sub-rule (1), for the words "agricultural tractor and construction equipment vehicle", the words "agricultural tractor, construction equipment vehicle and combine harvester" shall be substituted.

35. In rule 122 of the principal rules,—

(a) in sub-rule (1A), for the words "agricultural tractor and construction equipment vehicle" at the both places where they occur, the words "agricultural tractor, construction equipment vehicle, hydraulic modular trailer and combine harvester" shall be substituted;

(b) after sub-rule (1A), the following sub-rule shall be inserted, namely:—

1324 GI/15-6

"(1B) Every combine harvester and hydraulic modular trailer shall bear the identification number plate including the following information embossed or etched or punched on it:

i)	Name of manufacturer	:.....
ii)	Model name	:.....
iii)	Chassis number	:.....
iv)	Engine/Tractor make & model	:.....
v)	Engine Sl. No. (in case of Self propelled combine)	:.....
vi)	Month & year of manufacture	:.....".

36. In rule 124 of the principal rules,—

(i) after sub-rule (1A), the following sub-rules shall be inserted, namely:—

'(1B) There shall not be any requirement regarding fitment of rear under run protection device and lateral protection device in modular hydraulic trailers.

(1C) "T" signs, wherever used on modular hydraulic trailers, shall comply with IS : 9942 : 1981.'.

37. In rule 124A of the principal rules,—

(a) for the marginal heading, the following marginal heading shall be substituted, namely:—

"124A. Safety standards of components for agricultural tractors and combine harvesters.-";

(b) in sub-rule (1), after the words "agricultural tractors", the words "and combine harvesters" shall be inserted;

(c) in sub-rule (2), after the words "agricultural tractor" and "agricultural tractors", wherever they occur, the words "and combine harvesters" shall be inserted;

(d) after the second proviso, the following proviso shall be inserted, namely:—

"Provided also that in case of combine harvesters, if the shape of body work makes it impossible to comply with the height requirement of installation of the following lighting and light-signaling devices, it shall be allowed at a height not exceeding 3000 mm:

(i) Dipped-beam headlamp (Ref. clause 6.2.4.2)*
(ii) Front direction indicator lamp (Ref. clause 6.5.4.2.3)*
(iii) Front position lamp (Ref. clause 6.9.4.2)*
(iv) Front parking lamp (Ref. clause 6.12.4.2)*

*Note :Reference clause numbers of AIS-030:2001:

Provided also that the performance requirements of the lighting, light signaling and indicating systems of combine harvester shall be in accordance with safety standards AIS:062-2004, as amended from time to time, till such time as the corresponding Bureau of Indian Standards are notified:

Provided also that the performance of rear warning triangle fitted on combine harvester shall be in accordance with AIS:088-2005, except clause 1.4.3 of Annexure 6 therein, as amended from time to time, till such time the corresponding Bureau of Indian Standards are notified.";

(e) In sub-rules (3), (4), (5) and (7), after the words "agricultural tractor", wherever they occur, the words "and combine harvester" shall be inserted.

38. In rule 125A of the principal rules.—

(a) for the marginal heading, the following marginal heading shall be substituted, namely:—

"125A. Safety belt, etc., for construction equipment vehicles and combine harvesters.-";

(b) the following proviso shall be inserted, namely:—

"Provided that every combine harvester fitted with a cabin, shall be equipped with a seat belt for the driver and with a rear view mirror.".

39. In rule 126 of the principal rules, for the words "other than trailers and semi-trailers", the words "including trailers, semi-trailers and modular hydraulic trailer" shall be substituted.

40. In rule 126B of the principal rules,—

(a) for the marginal heading, the following marginal heading shall be substituted, namely:—

"126B. Prototype of every construction equipment vehicle and combine harvester to be subject to test.-";

(b) after sub-rule (1), the following sub-rule shall be inserted, namely:—
"(1A) On and from the date of commencement of Central Motor Vehicle (Fourth Amendment) Rules, 2015, every manufacturer of combine harvester shall submit the prototype of the combine harvester to be manufactured by him for test by any of the agencies referred to in rule 126 for granting a certificate by that agency as to the compliance of the provisions of the Act and these rules.";

(c) after sub-rule (2), the following sub-rule shall be inserted, namely:—

"(2A) The testing agencies referred to in rule 126 shall, in accordance with the procedure laid down by the Central Government, conduct tests on combine harvesters drawn from the production line of the manufacturer to verify whether the combine harvesters conform to the provisions of the Act, or rules, or orders issued there under:

Provided that the provisions of this sub-rule shall not be applicable in respect of any combine harvester up to and including the 1st day of April, 2015.".

[F. No. RT-11042/13/2008-MVL]

SANJAY BANDOPADHYAYA, Jt. Secy.

Note : The principal rules were published in the Gazette of India, Extraordinary, Part II, section 3, Sub-section (i) *vide* notification number G.S.R. 590(E), dated the 2nd June, 1989 and last amended *vide* notification number G.S.R. 168(E), dated 3rd March, 2015.

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Cargo Lashing & Securing Principles

Richard L Krabbendam
Heavy Lift Specialist & Founder
Krabbendam Advies Service

To understand how to lash and secure cargo on a moving vehicle like a trailer, railcar or ship, I first like to start with the basics. The three Laws of Newton form the basics of forces on cargo. When we understand these principles, then the rest will be relatively simple. Let me summarize Newton's laws:

First law:

When viewed in an inertial reference frame, an object either remains at rest or continues to move at a constant velocity, unless acted upon by an external force. Or expressed in other wording: If an object (mass) is moving (or stays at rest) at a constant velocity through space and is not affected by any other external force, the object will continue (or stay at rest) with the same velocity unless acted upon by an external force. In reality this never happens, as an object moving at a certain speed on a road, is always subject to friction (a truck driving at a certain speed, needs the engine to overcome the rolling friction, otherwise the truck will stop rolling). A cyclist needs to push the pedals to overcome rolling friction or wind force, otherwise it will eventually stop.

Second law:

A force F on an object is equal to the mass m of that object multiplied by the acceleration a of the object: F = m * a. If we have a briefcase with a mass of 10 Kg standing on the floor of a train, the earth's gravity is pulling at that briefcase (mass) with a force F = m * a, in which m is mass in Kg and a is earth's gravity (or acceleration) = 9.81 m/sec2. If we start moving or stopping (accelerating or decelerating) with a load, a horizontal force in opposite direction of movement, acts from the CoG of the load in addition to the vertical force, which acts due to earth's gravity. Both forces can be composed and will give a resultant force Fr. See Fig.1 at above. If Fr is pointing over

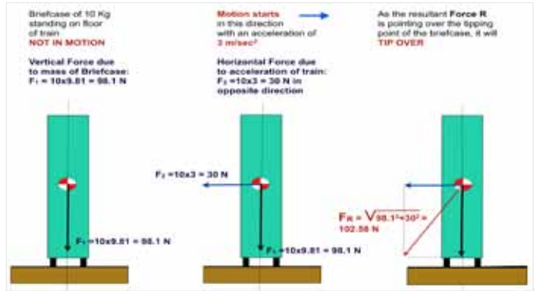

Fig.1 Briefcase on floor of train is subject to gravity force as well as a side force due to its acceleration, when the train starts moving

the two black supporting points, the briefcase will tip. If we turn the briefcase 90o, hereby increasing the base support points, the resultant force Fr, will remain within the support points and the briefcase will not tip.

Third law:

When one body exerts a force on a second body, the second body simultaneously exerts a force equal in magnitude and opposite in direction on the first body or simply said: Action = Reaction. In other words, the briefcase of Fig.1 will exert a Force of 98.1 N on the floor

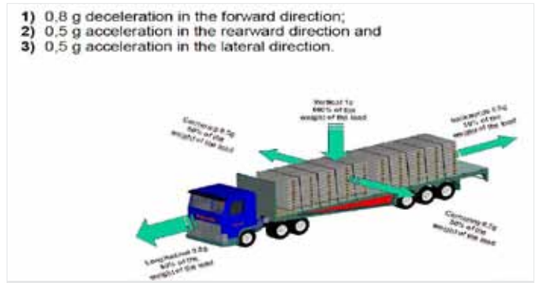

Fig.2 Max. accelerations/deceleration on cargo moving on roads

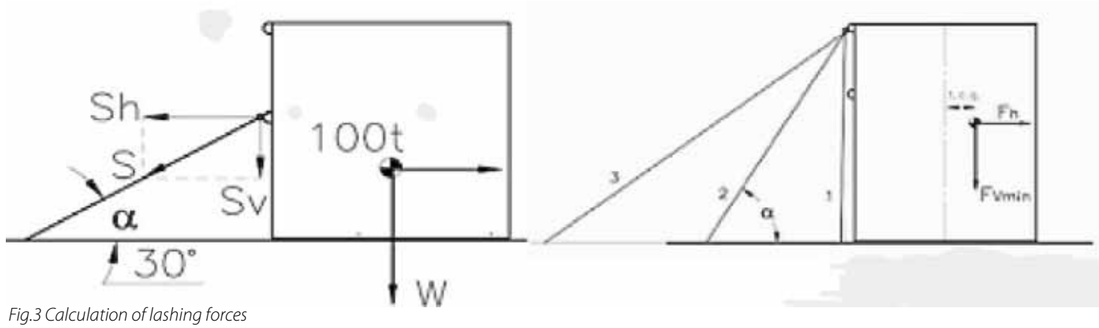

Fig.3 Calculation of lashing forces

and the floor will push back with the same force of 98.1 N. If no other external force acts on the briefcase, the briefcase will remain at rest and not tip.The above principle are crucial in understanding of how we can secure loads on a trailer or ship and avoid sliding or falling off.

Guidelines of Lashing and securing of Cargo

In order to calculate the acceleration and deceleration of our transport vehicle (trailer, truck, train, ship, barge etc.), we need to know what order of magnitude the accelerations and decelerations are in all three direction (X,Y and Z direction). The forces acting on the cargo depend on the acceleration/deceleration of the vehicle. As, we as users do not know the acceleration and decelerations of our vehicles, some guidelines have been drawn up. The Guidelines are primarily based on the EN 12195-1:2010 standard and also includes examples of safe practices from throughout the road transport sector. To safely secure cargo on trailers on roads, the EN 12195 norm is based on a max. forward deceleration equal to 0.8g = 0.8 * 9.81 = 7.85 m/s2, backwards of 0.5g = 4.90 m/s2 and a side forces in either direction of 0.5g = 4.90 m/s2 as shown in Fig.2 above. For road transports, you just need to calculate the forces on the cargo with Newtons Second law. I.e. if the cargo weighs 100 Tons, the forces in X-, Y- direction are: F=m*a = 100,000 * 7.85 = 785,000 Newton = 785,000/9.81 = 80,020 kg = approx. 80 ton. Depending on the angle under which the lashings are applied, we can calculate the force S and establish the correct number of lashings. See fig.3 below:

- S = Fh / (cos ⊠ x n) (in which n= number of lashings)
- Number of required 10t SWL lashings :
  n = Fh / (cos ⊠ x 10tSWL)
- n = 80t / (cos 30 x 10t) = 9.24 (so we need 10 lashings of 10 T)

In our example fig. 3 above, when we use lashings which have a MSL (Max. Securing Load) of 10 Tons, we need a min. of 9.24 lashings, which is rounded of to 10 lashings.

Lashing Calculations on Cargo vessels

The same basic principles apply for cargo on board of heavy lift vessels, barges or other floating objects. When we want to calculate the lashing forces, we again need to know the accelerations and decelerations of the cargo on board of the vessel. As this greatly depends on the stability of the vessel and the sea state it is sailing in, the

Fig.4 An example of lashing a Harbor crane using 10 Ton MSL grommets, turnbuckles, chain and shackle combinations

DNV Cargo Securing Model Manual has drawn up some Guidelines which can help calculation the forces on cargo. Depending on the vessel operator, the accelerations can be established using following methods:

- Ship owners Own Rules
- Rules defined by the Classification Societies
- Custom made computer analysis

Fig.5 Steel Stoppers to lock in cargo

Methods for lashing & securing of cargo

Restraining methods are principally the following:

- locking
- blocking
- direct lashing
- top-over lashing
- combinations of methods in conjunction with friction.

The restraining method(s) used should be able to withstand the varying climatic conditions (temperature, humidity etc.) likely to be encountered during the journey. Cargoes can be secured using a combination of lashing grommet, chain, turnbuckle and shackles. See picture in Fig.4 and Fig 5. Also cargo can be locked in using so-called stoppers, which are welded to the deck of the vessel and stop the cargo from moving in horizontal direction. Remember, always place friction material (plywood, rubber mats, anti friction mats) between the cargo and the steel deck and never place steel on steel surfaces, as the friction between steel and steel is approx. ⊠ of friction between wood and steel.

Tycan® a Synthetic Lashing chain

A new innovative alternative to steel lashing chains, still frequently used in lashing and securing of cargo on trailers and ships, is the new synthetic lashing chain made of Dyneema® fibers (so-called Ultra High Molecular Weight Polyethylene UHMWPE) and being marketed by Load Solutions AS near Bergen in Norway. TYCAN® lashing chains, made from Dyneema® yarns are up to eight times lighter then steel lashing chains with identical dimensions and strength. Due to its extreme light weight it makes working with these lashing chains far more efficient and due to the synthetic nature the chains do not easily damage fragile cargo like wind turbine blades as would be the case with steel chains. Despite the 2-3 times higher price for the same lengths of chain, it offers an attractive solution for sensitive cargo. The chains are

Fig.6 Nor Line AS tried Tycan® Lashing chains out during the development stage

made of approx. 10 links /meter length and can easily be adjusted in length similar to a steel chain. Breaking strength is 21 mTons with a Max. Securing Load of 10000 daN (10.19 mTons). There is only 4.8% elongation at breaking strength. Satisfactorily field tests have been carried out over the past year by Nor Lines AS as well as Mammoet Transport of the Netherlands. See pictures in Fig. 6 and 7. DSM Dyneema, the producer of UHMwPE fiber branded as Dyneema®, has worked with several partners on the development of chains fabricated from webbings that have numerous economic, environmental and safety advantages over traditional chains. Link chains have a multitude of uses, including lashings for heavy cargos on land, sea and air transport, and can be used for towing ships, for fencing and for logging operations. Now, DSM Dyneema has formed a strategic partnership with Load Solutions AS in Bergen, Norway, for development, manufacturing, sales and marketing of link chains made with Dyneema® fiber. The first products have already created substantial interest in several markets during their development phase. Development of the chains began in 2012, although DSM Dyneema has patents on the idea that date back several years earlier. Certification and testing has been going on over the last two years. TYCAN® chains have already passed the first and second levels of certification by DNV GL, the international classification society. Full and final certification of TYCAN® is expected in early 2015. They are now ready for commercial sale for lashing and tie-down in shipping and heavy freight trucking.

Many benefits in performance and safety for end-users

"TYCAN® chains are up to eight times lighter than regular steel version with the same strength," says Kjell M. Veka, managing director of Load Solutions AS. "First customers operating ships, trucks and trains are benefitting in their daily heavy duty lashing jobs with a significant increase in productivity, and reduction in damage to the goods they transport, and far fewer injuries to personnel." The new synthetic chains are more expensive than steel ones, but Veka says customers are willing to pay more for premium chains that are so much lighter than their old ones.The outstanding properties of the chains are largely due to the use of Dyneema® DM20 fiber, based on Dyneema® Max Technology, which ensures very high strength in the chain and very low creep, as well as the ability to survive very harsh operating conditions. The chains can be wrapped over the edges of cargo without suffering any damage. They also withstand the sorts of shock loads that may occur on ships sailing through very stormy weather, without any stretching that might cause the cargo to shift. The two companies decided to develop chains with Dyneema®, rather than offer ropes as an alternative to steel chains, because in many applications it is either impractical or impossible to use ropes. It is for example very easy to shorten link chains to the required length for any particular job by doubling them back using hooks. Ropes can only be shortened by winding the excess length onto a winch, while webbing requires the use of a ratchet to do the same thing. The flexibility of the TYCAN® chains provides a further advantage. Ropes for carrying very high loads tend to be thick and rigid, especially those made from steel wire. By contrast, chains are always flexible, whatever their size. The first version of the TYCAN® chain, which has shackles 100 mm long, 25 mm wide and 12 mm thick, weighs just 0.580 kg/m. Breaking strength is 21 tonnes. The chains can be made to any length. Because the chains are so much lighter than

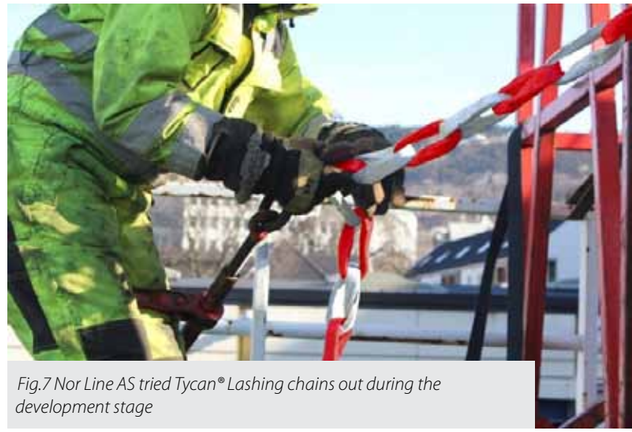

Fig.7 Nor Line AS tried Tycan® Lashing chains out during the development stage

steel versions, they can be handled with greater ease and put into position much faster. This greater productivity obviously is a key advantage for transport companies, especially when loading and unloading ships, since the time a ship spends in a harbor can be very costly. The fact that TYCAN® chains make far less noise than steel chains when they are being handled is a further important advantage, both for operatives and management. Operatives can communicate much more easily, for example, which helps increase the speed of operations. TYCAN® chains cause little or no damage to the cargo and to the equipment they are used on. Dents and scratches are not only unsightly, they can also cost ten of thousands of euros to repair or penalty. Furthermore, they are much less prone to damage themselves. Ultrahigh molecular weight polyethylene is very resistant to chemicals, the chains do not rust, and they always maintain a soft-touch feel. The chains are lighter than water too, so if they fall into the sea, they can easily be recovered.

"Our fiber is the only fiber in the world capable of giving the TYCAN® chains what they need in: superior strength at lowest weight, unbeatable bending fatigue and abrasion resistance, plus excellent outdoor performance and endurance even in very harsh operating conditions, whether on the decks of ships or on mega trailers, whether in sandy deserts or in stormy arctic oceans," says Dietrich Wienke, Manager New Business Development at DSM Dyneema. "Also inside factories, where a large amount of local materials handling is still done with steel chains, TYCAN® is an excellent choice."

Richard L Krabbendam

HTOA Team major activities in the Quarter Jan to Mar 2015

January 6th 2015 at Le-Meridien, New Delhi

Hosting of grand function in close collaboration with MoRTH for launching of online web portal for online movement permissions to ODC/OWC by Shri.Nitin Jairam Gadkari, Union Minister for RTH & Shipping, Government of India & Shri. Piyush Goyal, Minister of State (I/C) for Power, new & renewable energy, Government of India.

Unveiling of inaugural edition of HEAVYHAULERS- A heavy lift journal

Full day seminar on Heavy Transport in India- Entering a new era through Digitalization.

January 28th 2015 at New Delhi

Meeting with Shri. Vijay Chhibber, Secretary-RTH, Government of India.

January 31st 2015 at Bhopal

Meeting with Dr.Shailendra Kumar Shrivastava, Transport Commissioner, Madhya Pradesh

February 16th 2015

Meeting with The Principal Secretary- Transport, Government of Maharasthra

February 19th 2015

Meeting with Shri.Sanjay Bandopadhyaya, Joint Secretary-Transport, Government of India

Meeting with Shri.S.N.Das, DGRD & SS, Government of India

March 14th 2015

Quarterly HTOA executive committee meeting at Mumbai

March 23rd & 24th 2015

Meeting with:

a) Shri. Nitin Jairam Gadkari, Union Minister-RTH & Shipping, Government of India
b) Shri. Sanjay Bandopadhyaya, Joint Secretary-Transport, Government of India
c) Shri. Alkesh Sharma, Joint Secretary- LAP, Government of India
d) Shri. S. N. Das, DGRD & SS, Government of India
e) Shri. R. K. Singh, Chief Engineer, Bridges (S&R), Government of India
f) Shri. A. K. Pandey, Superintendent Engineer- Bridges, Govt.of India

interview Transcript

Organized By:

Ministry of Road Transport and Highways **&** Hydraulic Trailer Owners Association

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General Manager
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Felix D's Souza
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Lt Col Govind Tahil (Retd)
Head, Logistics and SCM
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Sanjay P Padwal
Head, HCC
L&T

B Maharana
Senior Sourcing Logistics Manager
GE (Power & Energy)

Kushawaha Gautam Dev
Asst Manager, Logistics
Toshiba JSW Power

About the inauguration and launch event of online permission facility for movement of Over Dimensional/ Over Weight cargo by modular hydraulic trailers on January 6, 2015, New Delhi.

Interview Transcript

HTOA: What are the challenges and difficulties that you face while transporting over-dimensional cargo in India today?

Anurag Chaturvedi, Senior Vice President, ABB

In fact, the normal cargo industry in India is quite established but when we look at heavy industry there are a lot of challenges as we have to seek a lot of permissions.

R. B. Bhatnagar, General Manager, Logistics, BHEL, Haridwar

So far this ODC movement was not all scientific. Because the data which is available with authorities who give us clearances is not very perfect. And whenever a consignment is shipped from our organisation, we are very concerned about our consignment, whether it will reach the destination or not.

G Kannan, General Manager, Logistics Management Centre, L&T

Presently, what happens is for transporting such large equipment you need a water front, then the first mile connectivity and the last mile connectivity has to be done by road. And despite all our efforts and the planning that starts more than a year in advance, in fact the day the job is awarded to the company. We find that we face tremendous difficulties. The basic difficulty that we face is the approach road when we come out of the ports. The port roads are very congested. There is no RORO facility which is available. Every minor and major port should have RORO facility

Satyanarayan, General Manager, Logistics, BHEL, Bhopal

For that, you have to understand that we have a gamut of consignments that can go on hydraulic trailers. Consignments of 35 to 300 tonne are also ODC in that sense.

Praveen K Rao, Additional Chief Engineer, Nuclear Power Corporation

By 2022, we have to generate 6,000 mw electricity based on pressurised heavy water reactors (PHWRs) all over India. About 5 to 6 equipment are overdimensional and overweight and have to be transported from warehouse of Bhel and GE to project sites. Sites are remote which makes transporting equipment more difficult.

Felix D's Souza, Head (Wind Operations), SE Freight and Logistics:

So we have blades 54 meter in length, which is a challenge especially at the fag end after national and state highways going through places to coast or non-resort hill stations. For that, we have special surveys done by people and modifications and all that.

Shreyas Ranadive, Head Logistics (Country), Linde Engineering Pvt Ltd

The major challenge that we are facing is multiple approval required from various government agencies, like we have to take approval from the ministry of MORTH, state governments because the vehicle is running on national highways as well as state highways

Lt Col Govind Tahil (Retd), Head, Logistics and SCM, Wind World

Vis-a-vis a company which is required to move heavy equipment like boilers and turbines, our challenge is different. I would like the industry to step in, I would like the MORTH to step in.

Sanjay P Padwal, Head, HCC, L&T

Capacity of plant is getting expanded in terms of global benchmark in production. Equipment sizes are going up. Equipment that we used to manufacture of 200 tonnes has reached thousand tonnes.

B Maharana, Senior Sourcing Logistics Manager, GE (Power & Energy)

You see the major issue is not movement of cargos; the major issue is law for the movement of cargos.

Kushawaha Gautam Rao, Asst Manager, Logistics, Toshiba JSW Power

We are having so many routes for waterways where we have limitations reaching those destinations, there are few points where we can take heavy lift packages and where we can have easy access for routes. Odisha is, for example, a thermal site where we have difficulties.

HTOA: What do you think about the initiative taken by the HTOA along with the Ministry of Transport for online permission and how does it affect your industry?

Anurag Chaturvedi, Senior Vice President, ABB

I am very happy and am in support of this initiative.

R. B. Bhatnagar, General Manager, Logistics, BHEL, Haridwar

For the first time, we have come under the same roof. HTOA, government and the industry associated with this type of cargo. At some point of time, they have to enter state area. So we should make them part of further development. It is point-to-point solution basically.

G Kannan, General Manager, Logistics Management Centre, L&T

This initiative was long overdue. I think we have been talking about this for last four-five years.

Satyanarayan, General Manager, Logistics, BHEL, Bhopal

This comes up in a nice way. In manual system, it takes one to three months to get permission. For cargo weight up to 108 tonnes, it will be reduced to the same day.

Praveen K Rao, Additional Chief Engineer, Nuclear Power Corporation

Being in government sector, from time to time regulations have to be followed. This online portal will definitely help

in streamlining procedures from clients and contractors' point of view.

Felix D's Souza, Head (Wind Operations), SE Freight and Logistics:

It will definitely speed up entire transportation process. Otherwise, most of the loaded vehicles are waiting for months for permissions. That would go off. That is a boon in fact.

Shreyas Ranadive, Head Logistics (Country), Linde Engineering Pvt Ltd

The first thing is that it will be an online application so tracking would be easy. And everyone can track when the application was made and details would be recorded. But at the same time, multiple approvals, as I said, state government's approval would be required. So my *suggestion would be the same data is transferred to state governments. Ultimately, approval will be given by some central agency like MORTH, so integrated approach would be more helpful.*

Lt Col Govind Tahil (Retd), Head, Logistics and SCM, Wind World

This is the start. Until you have the last mile connectivity, some person is always going to stop you. So you have the middle portion which is covered but you don't have starting and you don't have finishing. This is, I would say, a good solution but we want end-to-end solutions.

Sanjay P Padwal, Head, HCC, L&T

This portal has got all sorts of information-- this road has so many bridges how best it can be transported. If information is available at the portal, we can plan accordingly.

B Maharana, Senior Sourcing Logistics Manager, GE (Power & Energy)

We are spending almost 7 to 15 days for getting permission, sometimes month together. This will help us bring transparency and better timing. Let's wait and see how results come out.

Kushawaha Gautam Rao, Asst Manager, Logistics, Toshiba JSW Power

It is good opportunity in fact -- a very good initiative taken by all members of this group.

HTOA:Do you think anything more can be done? What is more you need HTOA as an organisation to further the industry or help it better?

Satyanarayan, General Manager, Logistics, BHEL, Bhopal

If roads and bridges are developed in a proper way, that will be a very big initiative.

Felix D's Souza, Head (Wind Operations), SE Freight and Logistics:

We need to work in close liaison with the ministry and try to get a streamlining of process whereby all permissions may be cleared within four to five days and not wait any longer because any gestation period is a cost.

Shreyas Ranadive, Head Logistics (Country), Linde Engineering Pvt Ltd

Just as IEC code is given for export-import, some code should be given to logistics companies. So performance of service providers can be tracked. This way, service provider will also be accountable. Any violation done by service provider should also be captured. That will deter the service provider from violating safety regulations

Sanjay P Padwal, Head, HCC, L&T

The more we meet the more we can discuss problems, more we will understand each other. Unitedly, we should have more sessions with government authorities so that issues can be addressed.

Kushawaha Gautam Rao, Asst Manager, Logistics, Toshiba JSW Power

Maybe, more studies about heavy lift consignments, some good workshop where we can discuss what challenges are coming up, explore the knowledge of the industry so they can contribute to Indian growth in terms of project as well as their own growth.

HTOA: What is the message you have for HTOA?

G Kannan, General Manager, Logistics Management Centre, L&T

I really compliment the association for taking the painful initiative to bring all stakeholders on the table, especially in dealing with the government

Satyanarayan, General Manager, Logistics, BHEL, Bhopal

HTOA has done an excellent job. I wish they should make more progress in future.

Praveen K Rao, Additional Chief Engineer, Nuclear Power Corporation

First part is with the government which is eased with this *online portal. And second, within the association -- we need to get rid of unscrupulous transporters. That is the next project they can take up.*

Felix D's Souza, Head (Wind Operations), SE Freight and Logistics:

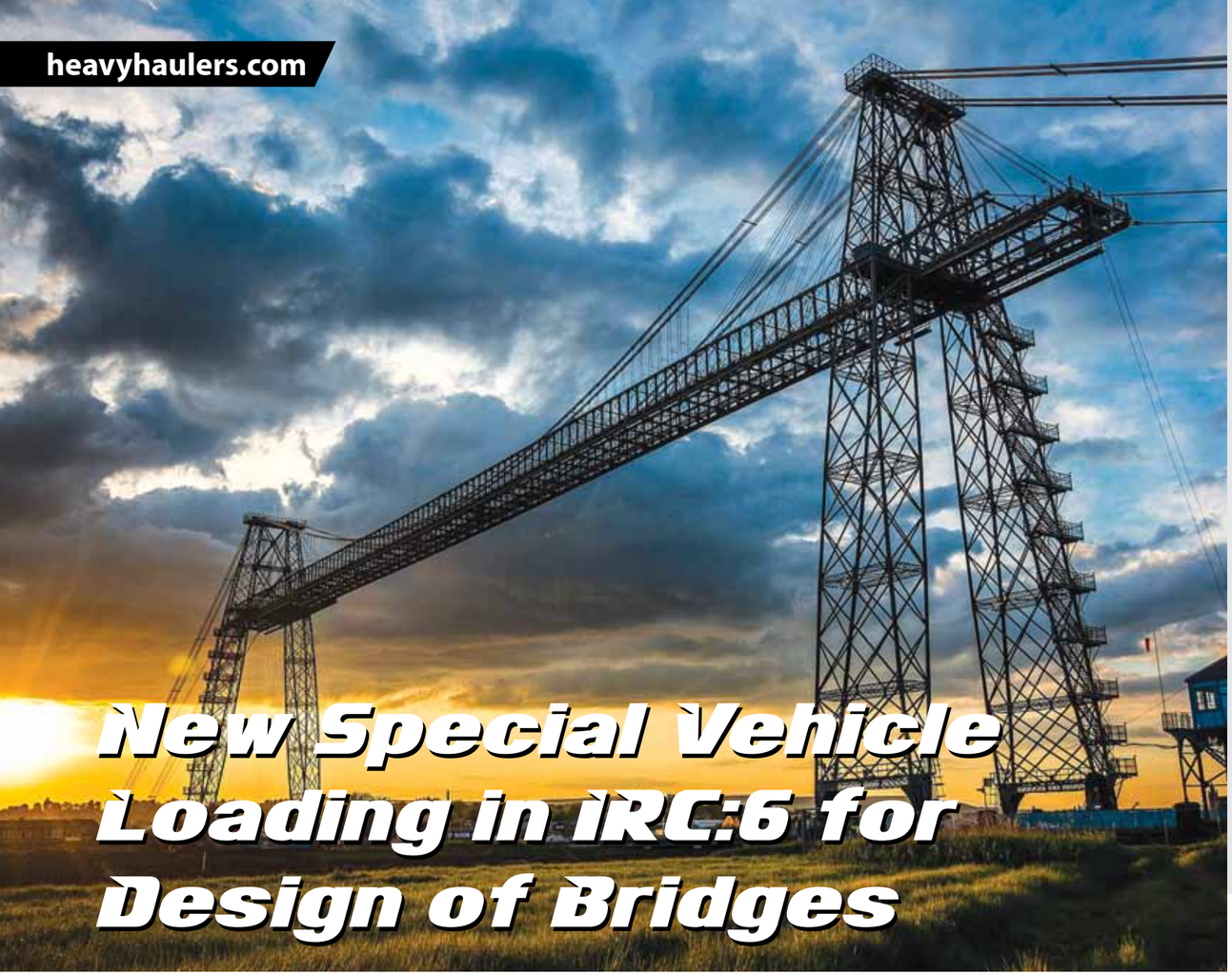
I am happy that they have organised such a thing and look forward to their close cooperation for better transport with safety in India in future.

Lt Col Govind Tahil (Retd), Head, Logistics and SCM, Wind World

I would say this is a very good beginning. But we must have more interaction otherwise, collectively, you cannot get your voice across

Sanjay P Padwal, Head, HCC, L&T

It was a good initiative. We should have more so that things can be openly discussed.



New Special Vehicle Loading in IRC:6 for Design of Bridges

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ABSTRACT

The paper discusses the background, basis and features of the new clause on Special Vehicle Load, introduced in IRC:6 (Published in Indian Highways(1)). This loading is to be adopted for design of new bridges in select corridors where passage of Over Weight Consignment (OWC) carrying stator units, turbines, heavy equipment and machinery may occur occasionally. This loading represents a spectrum of special vehicles in the country and should be considered for inclusion in the design where ever applicable. The impact of this loading on cost of bridge project is also discussed in this paper for the benefit of designers and decision makers

Keywords: Overweight Consignment, over dimensioned Vehicle, Multi-Axle hydraulic Trailers, abnormal loading, bridge failures

INTRODUCTION

Exponential growth in infrastructure sector in general and power sector in particular has led to construction of thermal/hydro/ nuclear power plants in different land-locked parts of the country in the recent past. This has led to significant increase in frequency of Over Weight Consignments (OWC) being transported by road using registered Multi Axle Hydraulic Trailers (MAHT). For carrying such OWC over existing bridges, at present, each movement of trailer needs permission from multiple authorities, which is causing inordinate delay in the delivery. In view of this, Ministry of Road Transport and Highways, (MORT&H), India also got a study conducted through Hydraulic Trailers Owners Association (HTOA) (2). The major objective of this study was to assess the adequacy of the existing bridge with identified span/ superstructure arrangement for carrying the OWC's multi axle hydraulic trailers and to prepare guidelines regarding the maximum number of multi axles hydraulic trailer units that can be permitted for a given type of consignment, span, superstructure type and deck configuration, satisfying the requirements of IRC: SP:37-2010(3), using working stress method of design. Also, this is to facilitate the transporters of OWC in planning the route/s as well as the vehicle type for shipment of their consignments and to enable the regulatory authorities to arrive at quick decision for regulating the safe passage of such OWC's. Based on this detailed study, guidelines were issued by MORTH (2013)(4) and the details of the study are presented in the paper in fib congress (2014)(5).

Some bridge failures took place in different part of the country due to over loading and during the passage of OWC, as shown in Fig. 1-4.

Realizing the above, (MORT&H) also felt the need to introduce a Special Vehicle (SV) load in IRC:6(6) for design of new bridges which can be adopted in select corridors as per requirement of the transport corridor. For example, in case authorities/bridge owners feel that a specific corridor (say bridges on port connectivity to the sites of heavy industries, thermal/hydro/nuclear power stations) is to be designed for passage of OWC, the loading criteria is available for the designers for application and safety of the bridges during the passage of OWC can be ensured up to the GVW of SV.

This paper discusses the basis and features of new Special Vehicle Loading for bridge design introduced in IRC:6 in 2014 and its implications on bridge design.

BRIDGE FAILURES DUE TO OVERLOADING/OWC

It is seen from literature that incidents of major bridge failures have been drastically increasing in USA as well as the rest of the world during the last decade and overloading was the second largest reasons. However, the number of failure of bridges reported in Europe due to overloading/ OWC was only 2. Table 1 shows some of these failures of bridges due to overloading or during the passage of a heavy load much larger than the design load.

Table 1. Bridge Failures Due to Over Loading/OWC

Sl N	Bridge Description	Country	Year	Reason
1	Water Bridge, Shanxi Province	China	2007	Collapse of one of the two spans, when 180T vehicle overloaded the bridge designed for just 20T
2	Harp Road Bridge	USA	2007	Failure occurred when weight of a truck hauling an excavator of 82T was moving over this bridge rated for just 16T.
3	Steel Bridge, Kullu, Himachal Pradesh	India	2008	Passage of OWC on an old posted bridge, capable of taking only 30T, led to bridge collapse (Fig. 1)
4	Tarcoles Bridge, 82m suspension Bridge constructed in 1924	Costa Rica	2009	Overloaded heavy trucks and weight of water pipe
5	Bridge over Shetranjuy River, NH-8E Gujarat	India	2009	Passage of OWC led to bridge collapse (Fig. 2)
6	No. 3 Quiangtang River Bridge, Zhejiang Province	China	2011	Partial collapse when two truck each loaded with over 100 T of goods were crossing the bridge
7	Balanced Cantilever Bridge, Madhya Pradesh	India	2011	Passage of MAHT with heavy turbine of GVW > 400 T led to collapse (Fig. 3)
8	Gongguan Bridge, Fujian Province	China	2011	Overloading
9	Steel truss Bridge, 85m span Sikkim	India	2011	During the passage of OWC carrying 100T (Fig. 4)
10	Bathe Bridge, Beijing (230m Span)	China	2011	During the passage of a 160T truck over this bridge designed for 46T
11	Devon Bridge, New Jersey	USA	2012	Overloaded by a garbage truck

Fig. 1 : Kullu (June,2008)

Fig. 2: Gujarat (Aug 22, 2009)

Fig. 3 : Madhya Pradesh (Sep 28, 2011)

Fig. 4 : Sikkim (Dec 19, 2011)

From Fig 1-4, it is seen that the failure can be either due to flexure or shear, when the load carrying capacity of existing bridge is much lower than the load effects produced by the OWC. Also, these failures had led to loss of human life

ABNORMAL LOADS FOR BRIDGE DESIGN – AN OVERVIEW

Prior to arriving at the new SV loading a study on codal provisions of some of the countries like UK, Europe and Australia were carried out and briefly discussed below:

Australia had introduced Heavy Load Platform, HLP 320 and HLP 400 with GVW 320T and 400T, for improving transport productivity, AUSTROADS (1992a)(7).

In UK, Type HB loading is included in BD 37/01(8)- Appendix A of the Design Manual for Roads and Bridges, considering the requirements derive from the nature of exceptional industrial loads (e.g. electrical transformers, generators, pressure vessels, machine presses, etc.) likely to use the roads in the area. The HB vehicle load is represented by a four axled vehicle with four wheels equally spaced on each axle. The load on each axle is defined by a number of units which is dependent on the class of road, for example, motorways and trunk roads require 45 units, Principal roads require 37.5 units and other public roads require 30 units, where, one unit of HB is equal to 10kN per axle. Also, BD 86/11(9) defines the Special Type General Order (STGO) and Special Order (SO) vehicles for assessment of Highway Bridges. STGO include vehicles up to 150T GVW, which do not comply Authorised Weight (AW) regulations such as those carrying abnormal indivisible loads. SO do not comply AW regulations and STGO. Further, SOV load models were introduced to assess the effect of SO vehicles. There are four SOV load models comprising of tractor and trailer combinations, i.e., SOV-250, SOV-350, SOV-450 and SOV-600 with maximum total weight of trailer up to 250T, 350T, 450T and 600T respectively. Maximum axle weight of trailer is 22.5T and minimum spacing between trailer axles is 1.5m. The braking load of Special SO vehicle must not be considered if the vehicle movement is controlled.

Eurocode, EN-1991-2(10) defines Group of loads gr5, the Special Vehicles and the different classes are given in **Table 2.**

TYPES AND CHARACTERISTICS OF MAHT STUDIED

Table 2: Classes of Special Vehicle in Eurocode (EN-1991-2)

Sl No.	Notation	Composition	Total Weight (kN)
1	600/150	4axle-lines of 150kN	600
2	900/150	6axle –lines of 150kN	900
3	1200/150	8axle-lines of 150kN	1200
	1200/200	6 axle –lines of 200kN	
4	1500/150	10 axle-lines of 150kN	1500
	1500/200	Or 7 axle -lines of 200kN + 1 axle line of 100kN	
5	1800/150	12 axle -lines of 150kN	1800
	1800/200	9 axle –lines of 200kN	
6	2400/200	12 axle-lines of 200kN	2400
	2400/240	10 axle-lines of 240kN	
	2400/200/200	6 axle –lines of 200kN (spacing 12m)+ 6 axle –lines of 200kN	
7	3000/200	15 axle-lines of 200kN	3000
	3000/240	12 axle-lines of 240kN+1 axle line of 120kN	
	3000/200/200	8 axle –lines of 200kN (spacing 12m)+ 7 axle –lines of 200kN	
8	3600/200	19 axle-lines of 200kN	3600
	3600/240	15 axle-lines of 240kN	
	3600/200/200	9 axle –lines of 200kN (spacing 12m)+ 9 axle –lines of 200kN	

Various types of MAHT are currently used in our country for transporting indivisible OWC. As per the HTOA, there are thirteen different configurations with Gross Vehicle Weight (GVW) ranging from 97 T to 601T including 25T weight of Puller Tractor, which are most commonly plying in Indian roads (**Table 3**). These vehicles are categorized in to 3 distinct groups as shown in **Table 4**. Loading arrangement of these MAHT is illustrated in **Fig. 5** to **Fig. 8** and it may be noted that the maximum axle load on each trailer axle has been considered as 18.0T and the spacing between consecutive axles is 1500mm.

BASIS FOR SELECTION OF SPECIAL VEHICLE FOR DESIGN

The Special Vehicle configuration chosen from the group

Table 3: Different Types of MAHT Currently Plying

Sl No.	Type of Load	GVW including Puller Tractor (T)
1	HT1-4	97
2	HT2-6	133
3	HT3-8	169
4	HT4-10	205
5	HT5-12	241
6	HT6-14	277
7	HT7-16	313
8	HT8-18	349
9	HT9-20	385
10	HT10-(8+8)Axle	313
11	HT11-(10+10) Axle	385
12	HT12-(14+14)Axle	529
13	HT13-(16+16)Axle	601

Table 3: Different Types of MAHT Currently Plying

Sl. No.	Vehicle Type	Axle Arrangement	Gross Vehicle Weight (*) (T)
1	HT1 to HT9 (Single Trailer unit)	Trailer Unit carrying 4 to 20 axles for HT1 to HT9 respectively	97 to 385
2	HT10 to HT11 (Twin Trailers with Turn Table Bolster)	(8+8) & (10+10) axle Trailer units for HT10 & HT11 respectively	313 to 385
3	HT12 to HT13 (Twin Multi-Axle Trailer with Girder Arrangement)	(14+14) & (16+16) axle Trailer units for HT10 & HT11 respectively	529 to 601

(*) GVW includes weight of puller tractor taken as 25T.

of 13 vehicles (Table 3) considered in MORT&H study and is such that it caters for 90% of the MAHT loads plying in the country and also fulfilling the following criteria:

a) From consideration of simplicity in use by designers, it should be a single puller-tractor vehicle, which will be representative of the load effects of majority of the MAHT that are plying on the Indian Roads. In order to

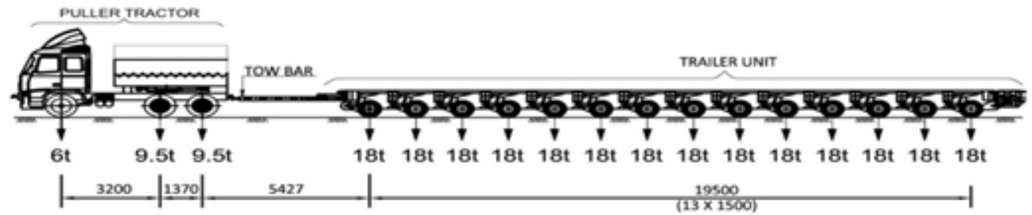

Fig. 5. Vehicle Type HT 6 (Typical for Vehicle Type HT1 to HT9)

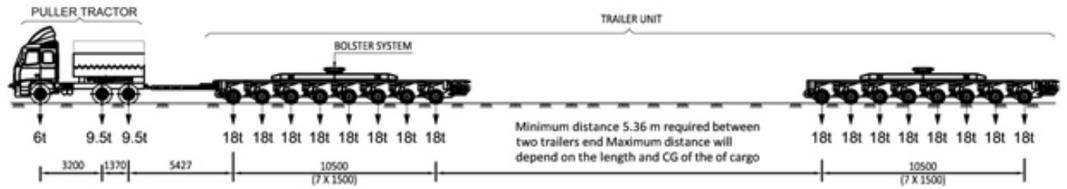

Fig. 6 Vehicle Type HT10 (Typical for Vehicle Type HT10 to HT11)

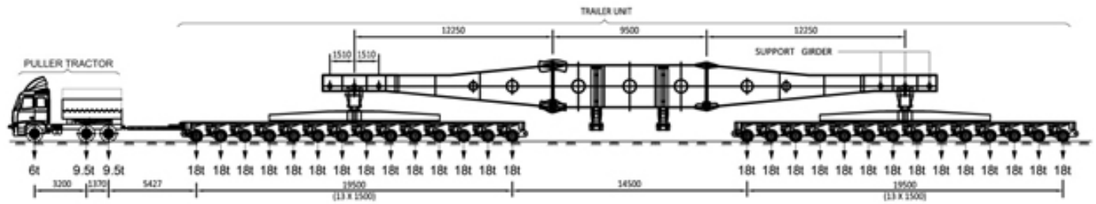

Fig. 7 Vehicle Type HT12 (Typical for Vehicle Type HT12 to HT13)

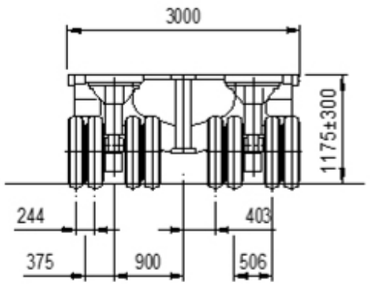

Fig. 8 Transverse Arrangement of Hydraulic Axles

choose the most appropriate trailer arrangement, the comprehensive analytical study(2) was also reviewed by the Loads and Stresses Committee (B-2) of Indian Roads Congress (IRC)

b) Considering the infrequent nature of these loads, the chosen load configuration including the magnitude of individual axle load and the total load, should not lead to significant increase in the initial cost of bridges in comparison to those bridges, which are otherwise designed for appropriate existing IRC Class 70R/Class A loading depending on the carriage way width and considering the dynamic impact of vehicular traffic.

c) In general, the MAHT carrying the OWC moves very slowly and the speed of crossing of such loading on bridge is limited to 5 kmph which is in line with international practice. Also, special precautions need

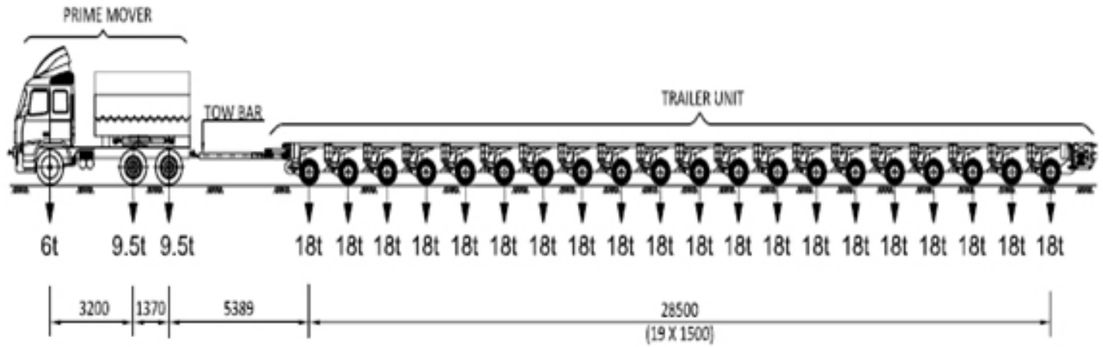

Fig. 9 Longitudinal View of SV

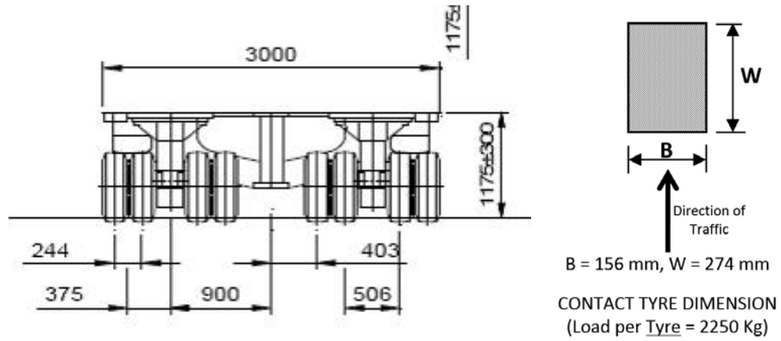

Fig. 10 Axle Arrangement of SV

to be taken to avoid application of brakes/acceleration while the MAHT is on the bridge. Further, in no case the vehicle shall be stationed over the structure. In view of this, no dynamic impact is considered during the movement of SV loading while assessing the design forces on the bridge.

d) In order to reduce the cost impact on the bridge, passage of such MAHT shall be regulated, which is in line with the current practice existing in many countries all over the world.

e) Only single lane of MAHT shall be allowed on the bridge at any given time. Also, it must ply at the center of the deck with a maximum tolerance of 300mm. No other vehicle shall move on any part of the carriageway/s when the trailer is crossing the bridge.

f) The movement of MAHT is not allowed over a bridge when the wind speed is high or at the time of flood. Also, it is assumed that no earthquake is likely to take place during the passage of MAHT. Therefore, the action of wind, earthquake and floods acting independently / simultaneously during the transportation of the OWCs is not to be considered, in conjunction with SV for bridge design,

g) It is to be understood that the Special Vehicle (SV) in IRC: 6 is an exceptional load. Such vehicles will not be allowed to pass the bridge without any regulations. These loads do not comply with the National Regulations and passage of such type of loads would require prior permission from the relevant authorities including checking of adequacy of the bridge with actual loads, even if the bridge is originally designed for SV loading.

Considering the above aspects, the Special Vehicle (SV) for bridge design as 'HT9' of the vehicles considered in MORTH study as this load gives the worst effect in bridges up to span 50m and therefore in case the design of bridge is checked for this vehicle, 90% of the existing OWC plying in the country will be catered for. Once the

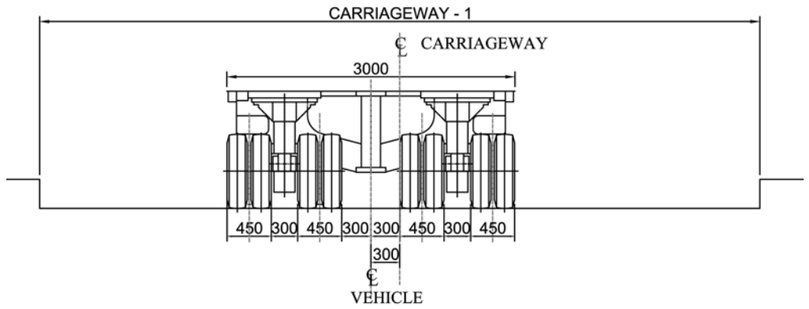

Fig. 11 Positioning of SV for Design as well as during the Passage over Bridge

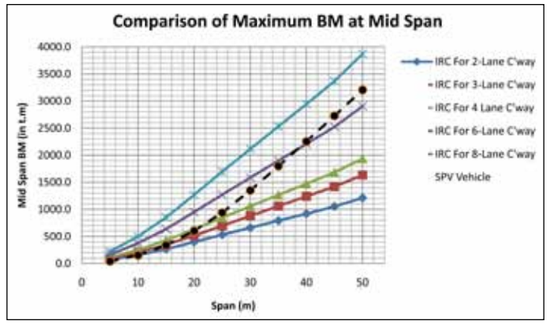

Fig. 12 Comparison of Maximum Mid span BM due to SV and Normal IRC Loading

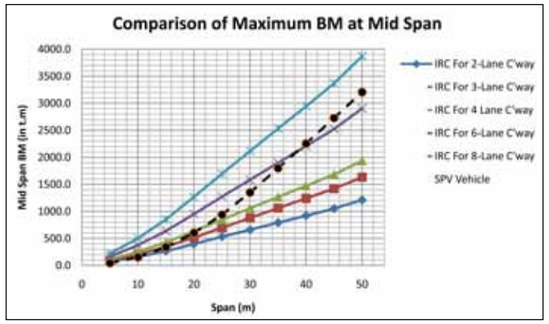

Fig. 13 Comparison of Support Shear Force due to SV and Normal IRC Loading

From Fig. 12 and 13, it is evident that superstructure design and detail and bearing design of the bridge will be affected by the SV loading. Also, following observations are made.

bridge is designed for this SV loading, safety of practically 80-90% of the bridges will be assured for majority (80-90%) of the OWC carried by MAHT.

DESCRIPTION OF NEW SPECIAL VEHICLE (SV)

The SV is a special multi axle hydraulic trailer vehicle, i.e., prime mover with 20 axle trailer, with a GVW of 385T and the longitudinal view is shown in **Fig. 9** and axle details in **Fig. 10**

Also, for the design and during the actual passage of SV Loading, it shall be considered to ply close to center of carriageway with a maximum eccentricity of 300mm for single carriageway bridges or for dual carriageway bridges, as shown in Fig.11. Also, during the passage of SV Loading, no other vehicle shall be considered to ply on the bridge. No wind, seismic, braking force and dynamic impact on the live load need to be considered as the SV shall move at a speed not exceeding 5 Km/hr over the bridge.

Also, for the load combination with special vehicle, the partial safety factor for verification of equilibrium and structural strength under Ultimate Limit State and for verification of Serviceability Limit State shall be taken as 1.0.

IMPACT OF SV LOADING ON BRIDGE DESIGN

To understand the impact of SV loading on design of new bridges, load effects were computed on simply supported bridges up to span of 50m and compared with the normal IRC loading as shown in Fig. 12 and Fig. 13.

(i)The impact of SV loading will be maximum for 2 lane bridges. Multi-lane bridges will have lesser influence.

(ii)Shorter spans having span length less than 20m do not have any significant influence of SV loading. Impact will be mostly for spans more than 20m. Longer the span length, more severe will be the influence of SV loading over 'normal' IRC loadings

(iii)Cost impact on Superstructure spans more than 20m is likely to vary from 10% to 30%, depending upon the span length. Longer the span more severe will be the impact.

(iv)The design of substructure and foundation in a bridge is mostly governed by the lateral loads caused by seismic / Wind / Braking forces and so on. Since passage of OWC is an infrequent and temporary condition, which will be regulated, these loads are not likely to affect design of substructure and foundation & there is no cost impact.

CONCLUSION

Vehicles carrying OWC threaten bridge safety and often cause many fatal accidents. Considering the increasing frequency of MAHT carrying OWC on Indian roads, due to exponential growth of infrastructure in the country, it was felt necessary to define SV loading in IRC:6 to facilitate design of new bridges in corridors where frequent movement of OWC is envisaged. IRC:6 recently introduced the Special Vehicle Loading including the associated load combination and design philosophy, considering the MAHT plying in India, and in line with international standards, so that transport productivity will be enhanced without compromising on safety of bridges.

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Structural Holes and Supply Chain Orchestration

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Our focus in this paper is on fusion of the fields of social networks and supply chain networks to obtain useful new results. In particular, we focus on architectures for Governance, Coordination and Control of global supply chain networks borrowing the concepts from social network theory. The task of governance of a network can be split in three parts: selection of partner companies, determination of the most effective form of the relationship among the selected partner companies and finally monitoring and execution of the agreed delivery schedules. We present our approach to supply chain orchestration. We are confident that this would lead to some breakthrough application research results in the near future.

Introduction

This paper addresses the fusion between two well developed subjects: the social networks and the supply chain networks. Social networks field is very well studied and there have been seminal contributions and text books on this topic. The focus in social networks has been on connectivity between individuals, social capital, dense and weak connections, strength of weak ties, structural holes and brokerage and closure. These concepts have been extended to inter-organizational networks and a topic that dominates the discussion is the Governance of the networks. Similarly supply chain networks have been a hot topic of the last two decades and several text books are in existence. Supply chains were concerned with performance measures such as inventory management, supply-demand matching, sensor networks to improve visibility and lead time and cost reduction. Packaged software implementations and supply chain planning are given attention.

There is literature on social networks and supply chain networks. Borgatti and Li provide a detailed view of social networks that is relevant to supply chain literature. Their aim has been to apply that concepts and theories of social network analysis to supply chain which has material, information and financial flows. There are also three sub networks within the supply chain namely the procurement, manufacturing and distribution. Procurement and distribution could be is globally dispersed controlled by a focal firm. Industries such as Food, Leather, and Apparel have large number of small players in the developing countries. Some central firms coordinate these activities. Similarly on the distribution side large retailers coordinate the sourcing of fresh vegetables to other products. Gereffi, Humphrey and Sturgeon have made substantial contributions to the supply chain governance literature. They presented several case studies particularly in auto, electrics and apparel industries.

In section 2, we review the concepts of social networks useful for our paper. In particular, we discuss the concepts of weak ties and structural holes. In section 3, we review the social network theory for inter-organizational networks. We review the global supply chain concepts in section 4. In particular we focus our attention global supply chain networks as inter-organizational networks. We review the supply chain ecosystem concepts in section 5.

Our results are presented from sections 6 onwards. In section 6, we present a four level Governance methodology for GSCNs. The four steps involve supply chain network formation which involves collection of all the partners including suppliers, 3Pls, Financial Institutions, agents etc of the supply chain. We also identify the risks associated with the business models, partners, countries, social groups, etc. Our second step is partner selection for the order on hand which tells who does what. The third step coordination involves scheduling and delivery of the order and the final step is execution monitoring and control. In section 7, we present the transaction cost approach for partner selection which is a generalization in the sense that the cost estimation is done using the ecosystem model. Section 8 presents mixed integer programming model for supply chain coordination.

The supply chain orchestration model is model

2. Social networks

A social network is a social structure made up of a set of actors (such as individuals or organizations) and the dyadic ties between these actors. Social network sites are webbased services that allow individuals to construct a public or semi-public profile, articulate a list of other users with whom they share a connection, and view and traverse their list of connections and those made by others within the system. People at great geographic distance can communicate with one another through surprisingly few intermediaries because of bridges between social worlds. Milgram found that letters had passed through, on average, six individuals en route—thus the phrase 'six degrees of separation.' The corollary is that we live in a "small world".

We briefly summarize some of the network concepts that are useful in our study.

The Strength of Weak Ties: *Mark Granovetter*

Ego has a collection of close friends-a densely knit clump of social structure. Ego also has a collection of acquaintances, few of whom know one another. Each of these acquaintances, however, is likely to have close friends in his own right and therefore to be enmeshed in a closely knit clump of social structure, but one different from Ego's. The weak tie between Ego and his acquaintance, therefore, becomes not merely a trivial acquaintance tie but rather a crucial bridge between the two densely knit clumps of close friends. These clumps would not, in fact, be connected to one another at all were it not for the existence of weak ties.

Structural Holes: Burt

People focus on activities inside their own group, which creates holes in the information flow between groups. Structural hole refers to the social gap between two groups. Structural holes often are the weak connections

between clusters of densely connected individuals. Holes are buffers, like an insulator in an electric circuit. People on either side of a structural hole circulate in different flows of information. Success in innovation is seen as depending upon the flexibility of the organization, and the ability to interact with outside organizations and third parties. Networks with an abundance of structural holes create opportunities for the new combination and recombination of ideas.

Brokers focus on establishing ties to other disparate or disconnected groups, exploiting the structural hole, so they can then bring together members of the two groups who would otherwise be more difficult to connect. We focus on brokers who can fill the structural holes in GSCNs.

Financial, Human and Social Capital

A person has three kinds of capital:

1. Financial capital which is cash on hand, reserves in the bank, assets, etc
2. Human capital: natural abilities, health, intelligence, looks combined with education and experience to excel in certain tasks
3. Social capital which is relationships with other players. Through friends, colleagues and other contacts, the players get opportunity to use his financial and human capital.

Social Capital

Certain people, or certain groups of people, do better in the sense of receiving higher returns to their efforts. Some people enjoy higher incomes. Some more quickly become prominent. Some lead more important projects. The interests of some are better served than the interests of others. The human capital explanation of the inequality is that the people who do better are more able individuals; they are more intelligent, more attractive, more articulate, and more skilled. Social structure is a kind of capital that can create for certain individuals or groups a competitive advantage in pursuing their ends. Better connected people enjoy higher returns.

The brokerage principle provides the argument that, in a business setting, an individual with a personal network high in structural holes can reap the benefits of high social capital by providing the indirect connection that resources need to flow around an organization. In a firm there are people who deliver quality product but there could be rain makers who deliver clients. The former does the work but the latter makes it possible to benefit from the work.

Similar conclusions are valid for organizations as well. Some do better than others. Is the reason the partner network or the connections with the non business organizations such as the Governments, social groups or both?

The Social Capital of Brokerage

Robert and James have the same number of connections, six strong ties and one weak tie. James is connected to people within group B who are densely connected with one another. Robert is also tied to everyone within group B. In addition, his strong relationships with 6 and 7 who are conduits for information on groups A and C. Robert is positioned to benefit from differences between people who vary in their behavior and opinions. People whose networks bridge the structural holes between groups have access to a broader diversity of information and also have experience in translating information across groups. These holes in social structure i.e. structural holes create a competitive advantage for an individual whose network spans the holes. This is the social capital of brokerage.

The above concepts weak ties, structural holes, social capital are applicable to networks of organizations.

3. Inter-Organizational Networks

An inter-organizational network consists of multiple organizations linked through formally established multilateral ties that facilitate achievement of a common goal. Network members can be linked by many types of connections and flows, such as information, materials, financial resources, services, and social support. Relationships among network members are primarily nonhierarchical, and participants often have substantial operating autonomy. Connections may be informal and totally trust based or more formalized, as through a contract. Partner Networks can bring competitive advantage

All or most network members connected, either directly or indirectly (i.e., through another organization), or is the network broken into fragments of unconnected organizations, dyads, and cliques? Fragmented networks may exhibit connections among organizations that are themselves unconnected or only loosely connected to other clusters of connected organizations i.e. network has many structural holes. Network effectiveness is the network level outcomes that could not be achieved by individual organizational participants acting independently. One of the issues widely addressed in the literature is the governance of inter-organizational networks. The question that is raised is what mechanism is used to govern and/or manage the overall network? Self-governance, or hub-firm or lead-organization governed, or a network administrative organization (NAO) model. We will discuss these models below.

Three Types of Network Governance

The network may be brokered or may follow participant shared model. In the participant shared governance model members divide responsibilities among themselves (Cooperatives). Network governance could be through a single organization

1. Highly Centralized Network External Broker (Li & Fung, Olam International)
2. Participant Shared Network Governance(Health care, Cooperatives in Dairy Amul)
3. Participant Shared Network Governance With a Lead Player
   - Producer-driven (Cisco, Nike)
   - Buyer-driven (Wal-Mart, Carrefour, Levi)

All three governance forms are in practice and none proved superior. In the following we apply these concepts to Global supply chain networks.

Ritter et al. (2004) point out that the research focus in inter-organizational networks is shifting from structures and governance to business models, planning, execution and managing relationships. Networks have now become a strategic option that firms can use to collaborate with partners to enhance the market share. The management function of network governance requires capabilities that enable a firm to identify partners, coordinate the resources, government and social agencies and activities performed by other members of the supply chain network, as well as abilities to plan and control activities at the network level.

4. Global Supply Chain Networks

In vertically integrated hierarchical companies, coordination and control of activities along the value chain is managed through ownership and direct managerial oversight. The company – together with subsidiaries, affiliates and joint ventures located in different geographic locations – retains ownership. However, Global supply chain networks (GSN) consist of a number of independent organizations, each concentrating on its core businesses, forming an alliance towards a specific goal. GSN is an Interorganizational network. The products and services generated by the global supply chain or service chain visit several countries, organizations such as a ports, customs, distribution centers and the facilities of the stake holders including suppliers, contract manufacturers, logistics providers and retail shops before finally landing in the customer's hands. The actors in a global supply chain network are linked through a variety of relationships such as subcontracting, licensing, common technical standards,

marketing contracts and shared network product and process-related standards.

Given the fragmented and competitive nature of the global supply chains, it is challenging for the diverse interest groups within the network to align themselves with the objectives of the global supply chain and the end-customer. The movement of goods, information and finances need to be felicitated by someone within these organizations or outside of them. One can see the importance of the connections between the supply chain stake holders. In fact it is known that in the small scale industries such as agriculture, contracting and textiles, connections are important for entering the global value chain.

This facilitation function involves supply chain governance, coordination and control (GCC) and is increasingly becoming critical for achieving competitiveness. Since the supply chain networks and their ecosystems involve companies which are globally distributed and are under independent ownership, the governance involves interorganizational coordination. The GCC of global supply chains requires interaction with several agencies such as resource owners, financial institutions, governments, social institutions, industry organizations, ports, airports, logistics and software providers and several others.

Partner network is becoming the competitive advantage of GSCNs. In the literature two types of hub firms have been identified: the tertius gaudens and the tertius iungens.

1. A sparse network is a network with structural holes, defined as the absence of connections among nodes in the network (Burt, 1992).
2. Dense networks are networks were most nodes in the network have ties with most other nodes in the network.

Literature debates the performance of companies bridging structural holes (brokerage) vs. those with tighter network relations (closure) .According to the closure perspective the tertius iungens gains from long-term intimate relations, because such relations stimulate knowledge exchange between the partners. The high level of trust in a closure network stimulates companies to share their skills and know-how. Hence companies in a closure network obtain important benefits. Keiretsu in

Japan, Chaebol in Korean, Guanxi in China are perfect examples. By positioning itself between two unconnected firms in a structural holes network it has access to two different unrelated sources of knowledge. Consequently the tertius gaudens, a person who brokers between two groups is better informed than other companies, which gives it a competitive edge.

There is tension between weak and strong ties. Strong ties promote commitment but also restrict firms' freedom to access new frontiers. The buyers may socially obligate themselves to partners with obsolete capabilities and ignore potential new partners with lower costs or better technologies. Weak ties (arm length relationships) on the other hand incentivize partners to be on the cutting edge in cost and innovation and also provides flexibility to sever ties if needs emerge.

Structural Holes in Global SCN Context

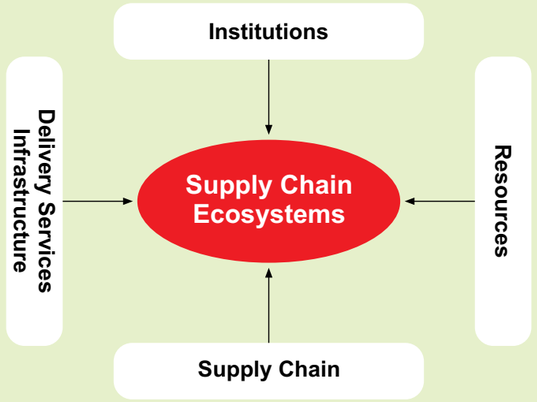
Networks do not act; they are a context for action. One needs to understand the information arbitrage by which people acting as brokers harvest the value buried in structural holes. How does one describe a hole between two organizations: a supplier in China and an OEM in USA? We can notionally call this as Chasm or the distance which includes geographic, institutional, infrastructural, logistical and resource dependent barriers. The broker need to bridge differences in culture, laws and regulation, and in organizational practices and resource regulations and practices (power, water, clusters, human, financial) and also in delivery infrastructure. The Chasm or distance created by these pillars of separation could have different affects on the supply chain performance. From bridging the information gaps to providing connections to the stake holders to interfacing with the Governments to get contracts, there are varieties of ways in which social connections can help. Several brokers thrive by filling in these holes.

5. The supply chain ecosystem

The supply chain ecosystem comprises of: networks of companies directly and indirectly part of the supply chain, countries of operations/presence and their governments, industrial, social and political organizations, logistics and information technology services infrastructure, the third party service providers that connect the companies and the countries to the external economic and social environment, resources including natural, financial and human resources with talent, connections and knowledge of the industrial environment, industry clusters, universities, etc interacting together with the landscape (horizontal and vertical) and climate (economic and social).

We categorize the above entities into the following four categories:

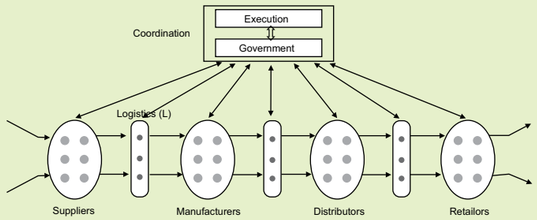
- Supply chain
- Institutions
- Resources
- Delivery Infrastructure



The ecosystem aware analysis of supply chains includes the following four factors: Performance, Risks, Innovations, and Governance. These four elements are discussed in detail in the forthcoming book by the authors. Governance is the issue that is important for this paper and we discuss this in detail.

6. Governance of GSCN

Governance of global supply chain networks is an important subject. Disintegration of supply chains as a follow up of modularization of products and outsourcing to low cost countries has happened in several verticals. Governance of these fragmented supply chain networks by reintegrating them through collaboration and coordination is happening today. Governance activities ensure that critical management information reaching the executive team is sufficiently complete, accurate, and timely to enable appropriate management decision making, and provide the control mechanisms to ensure that strategies, directions, and instructions from management are carried out systematically and effectively.



Thus, Governance, coordination and control are of particular importance in global value chains. It refers to how some lead firms determine and coordinate the activities of the actors in the supply chain. This includes selection of suppliers; what will they supply (outputs of suppliers in the network); how it is to be produced (e.g., product tolerances and process standards); assigning the functions to the suppliers and the production and delivery schedules (how much to produce and when); and upgradation of suppliers in terms of equipment, capacity and their moving up the value chain (e.g., moving from manufacturing into design), and others. Also, key production parameters such as the product definition, specification, the production schedule and location, the technology to be used, quality systems, labor standards and environmental standards need to be decided along with the targeted price and communicated to the chain partners. In addition, Government agencies and international organizations regulate product design and manufacture, keeping in view the consumer safety, and market transparency as in case of food safety standards, children's toys, and motor vehicles. There could be regulation on environment and child and women labor. The broker or lead firm has the responsibility that the labor laws are followed and products follow the environmental standards.

Although the Governance issue is discussed by several authors, an analytical procedure for Governance and the suitable organization structure for implementing the mechanism were are not addressed. This paper fills in the gap. Our Governance design for a given vertical has four steps: Formation, partner selection, Coordination and Execution.

In most cases the procurement strategy is pooled interdependence, where each individual company in a group makes a discrete, well-defined contribution. Pooled interdependence has a flavor of weak social ties and structural holes as "arbitrage" opportunities. According to Thompson (1967), pooled interdependencies are well managed by standardized rules and shared mechanisms to orchestrate transactions. Internet-based procurement is creating pooled interdependencies between a large number of loosely coupled agents, where standardization of connection and transacting procedures is the key coordination mechanism enabling low cost supplier participation. However, lead firms also adopt strategies to reduce the complexity of these transactions. One important way of doing this is through the development of technical and process standards. The complexity of information transmitted between firms can be reduced through the adoption of technical standards that codify information and allow clean hand-offs between trading partners.

Stage	Governance level	Functions
1	Supply Chain Formation	Acquire domain knowledge about the vertical, taxes, tariffs business friendliness of the countries, Builds business models and relationships for growth enhancement, Identify stake holders for all the supply chain functions, Assess possible political economic risks, regulations on product environment and labor, Build systems for effective communication, collaboration and coordination among the network partners. Develop connections with all ecosystem partners,
2	Partner selection	For the given order, select the supply chain partners to optimize the performance selection of suppliers; assign functions to them such as what to supply, how is it to be produced (e.g., product tolerances and process standards),
3	Planning	For every order, the production and delivery schedules (how much to produce and when) and to whom and when to deliver.
4	Execution	Monitoring the order execution for product quality and timeliness of the activities of spatially distributed independent actors. Such as sourcing, design, production, distribution and service and take action for any deviations

Network Formation: Based on the vertical we identify the suppliers, industry logistics providers, financial and insurance agents, customs, port infrastructure governments involved for the entire network. Collection of the data on all the supply chain players regarding their quality and delivery reliability is part of this exercise. Also taxes and regulation changes in the offing in the countries, possible natural, political and economic risks, are all also collected during this step. More importantly connections and trust are established with the players. This deep domain knowledge and connections are vital for success.

In case of partner selection, optimization techniques are used. A modified transaction cost economic model based on the ecosystem is described below. We may comment that that the TCE model is used to decide on the hierarchy or market structures, here we use the same for partner selection.

Partner selection (Structural & Relational) involves selection of partners for the particular order. In the globally dispersed networks, each order may visit different supply chain members depending on the location of the customer, political and economic situation, resource costs, transport costs and capacity availability. Because of the short time span for the order execution the suppliers can be selected with minimal partner or political risk.

Coordination:

Coordination is to bring different elements of a complex activity or organization into a harmonious or efficient relationship"(Oxford Concise Dictionary, 1999). The basic organizational or management challenge in global supply or service chain networks of this kind is the coordination of its activities sourcing, design, production, distribution and service with spatially distributed, independent actors.

There are several activities that need to be repeatedly performed in a timely and orderly manner end to end by the network participants. Key parameters such as the product definition, specification, the technology and the quality systems, labor and environmental standards need to be decided along with the targeted price and communicated to the chain partners. In addition, Governmental and international organizational regulations on product design and manufacture for ensuring consumer safety (as in case of food safety standards, children's toys, and motor vehicles) and on environment and child and women labor need to be adhered to by all partners.

More importantly, decisions need to be made on the following

1. For every order, selection of suppliers; assigning the functions to them such as what to supply, how is it to be produced (e.g., product tolerances and process standards), the production and delivery schedules (how much to produce and when) and to whom and when to deliver, etc
2. Upgradation of suppliers in terms of equipment, capacity and delivery methods to meet the regulations, standards and delivery schedules

Control

This step involves the real time control of the supply chain execution which involves monitoring the goods flow from origin to destination and making decisions to counter events that cause disruptions such as truck failures, customs payments or driver ill health to maintain the commitments to the customers. Also, this step includes exception management using tools such as expert systems, decision support systems, case based reasoning etc. Currently this step is ignored and is done through expediting in case of failures.

Organization Structure

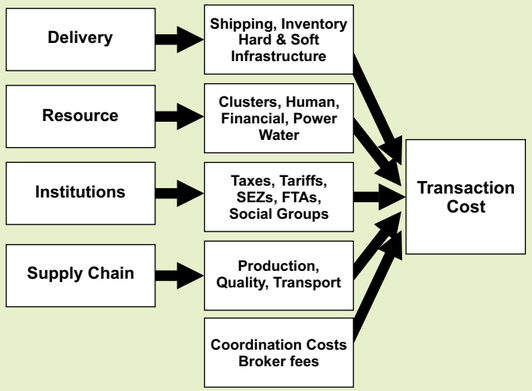
Governance, coordination and execution are done through a well defined network organization structure. Organization structure in companies is allocation of work roles and an administrative mechanism that creates a pattern of interrelated work activities and allows the organization to coordinate, conduct, and control its work activities. The organization structure is reflected in the organization chart, which gives each employee his or her place in the organization, tasks and responsibilities, and supervisors. In case of networks, the network-organization structure may exist formally in case of brokered networks or informally in case of participant governed networks.

7. Partner Selection using Transaction Cost Economics and Governance

Transaction costs are defined as the costs which are made in order to coordinate and connect all links in the global supply chain. Transaction costs relate to finding a suitable trading partner, negotiating, setting up and signing a contract, monitoring compliance with the contract, and imposing fines if the agreements are violated. They include observable costs such as transport costs, import duties and formal trade barriers such as customs tariffs, Soft costs which include making and monitoring contracts, information costs, costs due to cultural differences and miscommunication, unwritten laws, trust building, networking, risk costs, costs due to safety regulations and provisions, etc. The hard observable costs decrease with trade liberalization and decreasing transport costs , the soft costs gain relative importance. Three characteristics of transactions that affect the size of transaction costs: asset specificity, uncertainty and frequency. Transaction Cost Economics (TCE) posits that when transaction cost are low, the transaction will be carried out through the governance structure spot market, and when transaction costs are high, it becomes efficient to set up an organizational structure (hierarchy in the terminology of Williamson) for carrying out the transaction. In between market and hierarchy, there is the governance structure hybrid.

Asset Specificity

We interpret the asset specificities using the supply chain ecosystem framework. We have the supply chain specific assets that concerned with the supplier manufacturing processes such as specialist dies and manufacturing processes. Other Supply chain specific assets are good relationships between members of network. The physical



asset specificity and dedicated asset specificity are included under the supply chain assets. There are asset specificities under the resources wing: these include the human, clusters, financial institutions etc. location specific infrastructure such as ports and airports which attract the companies to the location. Delivery infrastructure specificity includes customized logistics and IT processes that enable on time delivery, 3PLs and IT providers, etc. Institutions also create specificities giving companies several benefits in terms of taxes and tariffs with special regulations, creating special economic zones, special universities for training manpower, etc. Special trucks for carrying finished vehicles (outbound logistics) and also special trucks and ships for delivering heavy power plant equipment such as boilers(Inbound logistics), Temperature controlled warehouses, refrigerated vehicles, Sophisticated forklift trucks, guidance systems, etc are asset specific. Some of these costs are irrecoverable: The ecosystem and the investment climate widen the definition of asset specificity from supplier – buyer to tying the businesses to the location.

Frequency and Uncertainty

"Frequency of interactions" between the buyer and supplier is important for reasons of economies of scale

1. for the specialized mechanisms created,
2. for transfer of tacit knowledge in customized exchanges
3. for establishing relations with partner's network partners

"Environmental uncertainty" can come from suppliers, customers, competitors, regulatory agencies, unions, or financial markets. Understanding the sources of uncertainty is important, since they influence what governance form is used to coordinate and safeguard exchanges

Even under modest levels of supply uncertainty, combined with predictable product demand, entice firms to integrate vertically where as demand uncertainty encourages firms to disaggregate into autonomous units, primarily through outsourcing or subcontracting. For example, the network structure of the textile industry in Prato, Italy, enhanced the textile firms' ability to respond quickly to changes in fashion. In Japanese automobile keiretsu, decoupling enhanced organizational flexibility as parties learned from one another what reduced lead time and improved quality for new models In the film industry, structured relations among subcontractors and film studios are based on a division of labor: film studios finance, market, and distribute films, whereas numerous subcontractors with clearly defined roles and professions (e.g., producer, director, cinematographer, and editor) create the film.

8. Orchestrator Governance Model

Network orchestration is broker driven network governance model. In this case a firm outside the network takes the governance responsibility. The orchestrator firms do not own any production facilities and their basic role involves coordinating and integrating activities along a given value chain. Because they own fewer assets and leverage the resources of partner companies, network orchestrators generally require less capital and often generate higher revenues than traditional firms, in several product markets. We now consider the governance mechanisms in detail. Orchestrators have been around for quite some time in certain industries. Contractor of a for a large commercial building construction project, the cinema producer, a lead logistics provider are examples of orchestrators. In the Agri-food area is the Olam International Limited which supplies raw and processed agricultural commodities, grown mainly by small and medium size producers in developing and emerging countries, to well established regional nd international customers In apparel business, Li & Fung provides a powerful example of a new kind of sophisticated orchestrator coordinating a very broad process network.

As mentioned in Hinterhuber (2002) the network orchestrator has four roles: network architect, network judge, network developer, and charismatic leader. The task of the network architect is to select member companies that make up the business network and to set objectives. The role of the network judge is to set performance standards to which the member companies of the business network must comply. The third role, network developer, is to develop a network's physical and non-material assets, including knowledge acquisition, knowledge transfer across the member firms and the creation of a strong brand image. Lastly, the role of a network orchestrator is that of a charismatic leader that should promote its capabilities, connections, successes and brand. Our network formation stage involves all these activities.

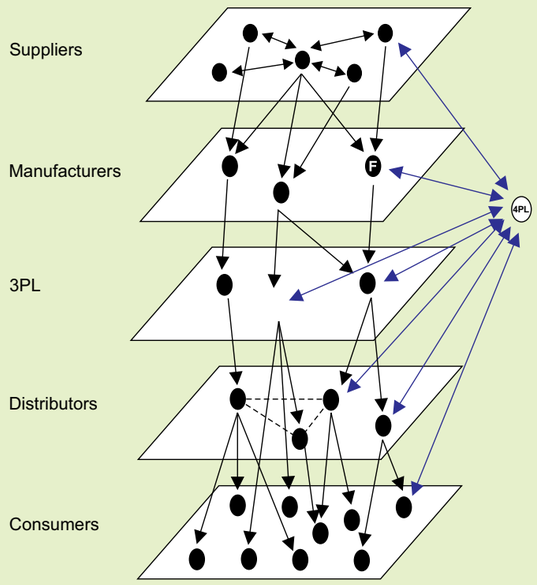
Orchestrators are "learning organizations" with privileged relationships; their employees may never touch a product. Such organizations mobilize other companies' assets and capabilities to deliver value to customers. Orchestration involves more than simply the bringing together of a set of capabilities. It is the assembly and management of a whole range of tangible and intangible elements—design skills, manufacturing capabilities, a workforce, a brand, a distribution system—into a functioning whole. ***For an Orchestrator the supply chain formation and execution are the most important steps.***

9. Supply Chain Orchestration: Examples

Here we provide three examples of supply chain orchestrators from the literature. The first one is fourth party logistics provider, the second one is orchestrating SME value chains in particular the print supply chain and finally the mandi in agriculture supply chain in India.

Fourth party Logistics Providers

4 PLs can emerge as intermediaries at various stages of the supply chain. On the supply side the IKL can manage inbound shipments, as exemplified by Vector SCM for General Motors and Exel for Ford (in Europe) amongst



others. Similarly, there are consumer centric 4 PLs such as Amazon.com, UPS and others. At a slightly higher plane, there are 4 PLs, also known as channel masters, such as Dell and Cisco who manage the entire supply chain network inclusive of the demand, supply and service chains.

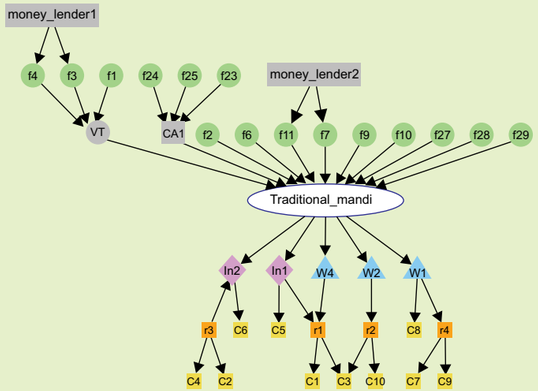
4 PLs are, typically, dominant players within their supply chain networks, who possess deep domain knowledge and strong influence over other parties in the network. They exploit this clout to coordinate the activities across players within the sub-network and across the entire network. Due to the fact that 4 PLLs leverage upon the complementary capabilities of other parties in the chain as and when needed, their offerings are characterized by a broad scope of multi-modal services, global reach, complex management capabilities, and superior technological systems. Based on customer requirements, an IKL is able to select effective supply chain partners to team the best competencies available that optimally fulfill the requirements. Their ability to coordinate activities is to a large extent determined by their ability to transform their superior information, on the state of the network, into real time decisions that enhance the performance of the entire network. By substituting physical assets with dependable r lationships new value players such as 4 PLs dominate the supply chain, outsource noncore

capabilities to contract manufacturers and 3PLs and take control of the supply chain decision process.

Orchestrator is highly embedded in the supply chain, almost all the actors will interact with it and its betweenness centrality highlights its importance to the success of the supply chain.. The relationship between the focal firm and the O represents a strong tie in the sense of providing access to valuable resources that in this case are the benefits arising from O know-how and relationships.

Mandi as an Orchestrator matching supply and demand

In India there are a large number (around 7000) of public wholesale market yards for agricultural products which are regulated through an Agricultural Produce Market Committees (APMC) act. As per the regulation all the food retailers need to buy the agriculture products through the Mandi and not directly from the farmer. Mandis were created to provide the farmers a centralized marketplace to sell their produce at a fair price. Some of these laws have been relaxed over time, allowing investment opportunities for the private sector. The farmers bring the agricultural produce to the Mandi's physical location where it is auctioned and sold to the traders, who are registered with the Mandi. The auction



format is the classical open-cry ascending price auction (English auction). The traders in-turn sell the produce to wholesalers, retailers, or companies.

Players in the current Mandi system

- Farmers- They are sellers of agricultural produce. Their objective is to get the best price for their produce. Their options are sell it to a village trader, a commission agent or a trader at the Mandi.
- Commission Agents- These are the middlemen or the brokers They buy from a farmer and sell to a trader charging a commission.
- Traders- They are registered with the Mandi. They bid on the items and buy them to sell in turn to s wholesalers, industries or retailers.
- APMC / Mandi Staff - Their role is to ensure that the tendering /auctioning process takes place smoothly and transparently in the market and maximum number of farmers derive the benefits of their service.

The current agricultural network has structural holes.On one side there is the group of farmers (sellers) and on the other side, there are consumers (buyers). These two groups are not allowed to buy/sell directly with each other and are forced to transact via the Mandi In the Mandi system, traders have a high bargaining power (a monopoly) on the prices. Traders are in a powerful position in the network (due to the geographical locations of farmers and consumers). Moreover, in some situations, the traders are a cartel.

Based on Burt's theory, nodes get benefits (informational and economic) by filling structural holes in a network. In addition to the electronic exchange, there is a huge opportunity for new players to fill the structural holes and act as a bridge between farmers and consumers. Private Players (like Reliance Fresh, ITC) or Farmers Co-operatives (like AMUL, Safal, Nandini etc.,)

The Mandi Exchange is playing the role of an orchestrator and connecting all the stakeholders in the agricultural ecosystem. It is a system designed to favour the farmers and empower them with information and choice. In addition to the tasks mentioned before, over time, the Mandi Exchange will estimate the demand for each commodity and advise farmers on how many hectares of cultivation is required.

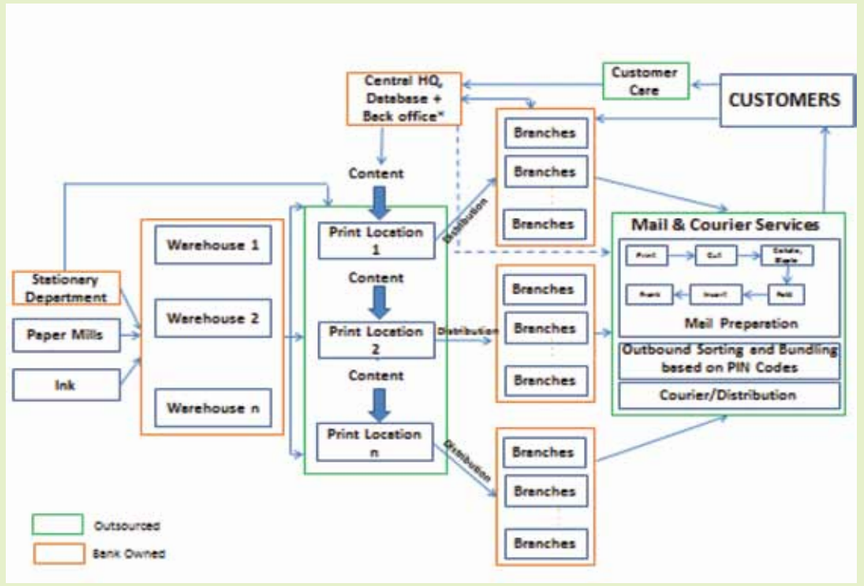
The Print Supply chain

The print supply chain network is a loosely coupled system with spatially dispersed independent companies coming together for delivering value to the customer. The print business networks consist of specialists in printing and complementary players such as packaging companies, logistics providers, IT companies, etc. Our focus in this paper is in designing an orchestrator for end to end print service chain network with focus on consumer oriented sectors such as banking, retail and insurance. In other words, we would like to create an inter-company print business network to create fundamentally new markets.

For example, the print supply chain map for document supply to Banks is depicted in Figure 1. Here, the banks have various kinds of stationary requirements at their branches such as envelopes, staionary, application forms for account opening, car or housing loans, motor, health and home insurance, etc and also for depositing or withdrawing cash or check. The print document requireents are consolidated and printed and supplied to the bank branches which are geographically distributed. Typically, couriers are the logistics prioviders that transfer document bundles among the stake holders and the logistics cost could sometimes be as much as or more than the print cost. Do the stke holders communicate among themselves regarding the demands, inventories, changes in the document content to follow the changes in the regulations? Most probably they work in silos and do not communicate. The result - high cost, obsolete inventory, unavailability of the required documents at the branches resulting in customer dissatisfaction.

We find that the

1. Print supply chain needs to be efficiently designed and managed. The print locations and distribution networks need to be strategically chosen with up to date printing equipment and technologies. The operations of the supply chain stakeholders should be visible to each other and well coordinated. The design should mitigate risks such s changes in regulations, weak infrastructure, labor problems, and other ecosyste parameters which are common in emerging markets.



2. The print supply chain partners are distributed spatially, and are under independent managements, and above all they are small enterprises. They are

sequentially connected i.e. output of one feeds to the other. The supply chain needs to be orchestrated by one of the players or an outsider.

The main commitment of the orchestrator is to print and deliver various documents in right volumes and at the right time to the bank branches and the customers. The product that is being offered by the orchestrator is the document service delivery solution via the value chains (Print and deliver documents to the branch or customer sites). This includes Document creation (help the customers in design of documents), Document print, Document delivery to the customer with desired quality. What are the innovations in product and process and other ecosystem items to execute the mission with less cost and high customer satisfaction and to build a blockbuster industry are to be addressed in the strategy. Identification of opportunities to apply technologies in the service chain is another motive.

Conclusions

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Strategic Insight on the Project Logistics Market in India

OVERVIEW

By definition, Project Logistics means specialized transportation, storage and related value added services for building/establishing a project such as a manufacturing plant or a port terminal using single or multimodal transportation services. Project logistics services include transportation, warehousing, freight forwarding, and value-added services such as documentation, customs clearance, loading, lashing, equipment rental, route and site surveys and feasibility studies. This could require large-scale assembly or disassembly and reassembly at a defined location and transporting the components to/from the location. This mostly involves non-conventional or out-of-gauge or over dimensional consignment cargo (ODC) consignments, and hence requires specialized equipment, processes and expertise to manage/fulfill the logistics requirements. Based on the activity, the Project Logistics market could be divided into ODC consignments and Non-ODC consignments.

Most over dimensional consignments (ODC) are all well within the load bearing capacities of regular tractor and trailer configurations, but others require the use of special purpose-built equipment depending on consignment attributes such as volume, dimension, and weight. The classification of project cargo is done either in terms of dimension or axle load as below.

In terms of services the market is segmented into – transportation, warehousing, freight forwarding and value added services. The project transportation services are largely offered using normal 25T, 31T and 49T commercial vehicle tractors used in combination with single or multiple axle flatbed trailers. Warehousing services as part of project logistics services largely involve the use of open, secured yards, ideally with flattened heavy load bearing surfaces. Infrastructure development in India is still heavily dependent on imported input such as capital goods, technology intensive machinery for various sectors, special construction equipment etc. Logistics value added services (VALS) for project logistics assignments are limited to a few specialist activities such as route planning, route surveys, site surveys, etc.

Key Drivers of Project Logistics Market in India

Large-scale Expected Investments in Ongoing Projects and Planned Projects

India can expect to see a total investment of about US$3.05 trillion earmarked for the period FY 2015 to FY 2019, which is expected to create a high potential for project logistics market during this period. The manufacturing sector is expected to see a significant share of this total investment. Consequently, the project logistics market for the manufacturing sector is expected to account for about 25.4% of the total project logistics market in India. Of the projects that are currently in various stages of execution, around 1220 are expected to be completed between 2015 and 2019. Around 301 projects that are currently in planning are expected to be completed between 2016 and 2019.

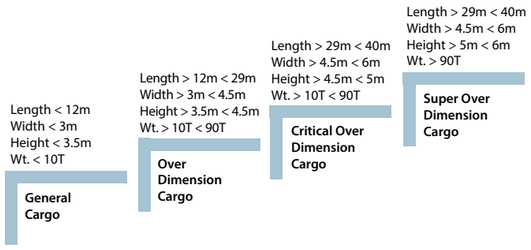
Demand for Specialist Project LSPs

Project logistics is a complex service that requires the combination of several different, and unique skillsets. Loading, lashing, surveying, and route planning are some of the unique skillsets and expertise required to offer a project logistics service.

Furthermore, project logistics services often involve the use of purpose-built, heavy machinery, which are largely

not manufactured in India, and need to be imported. As a result of the high capital investment required to acquire this special machinery, and the limited use for such machinery outside of project logistics services, only a limited number of companies are equipped with the requisite funds, and skillsets to be able offer these specialist services. Given the expected market opportunity for project logistics services in the country and the number of projects currently in execution and planning, the conditions are ideal for new companies to enter the market to offer project logistics services.

Exhibit 1: Indian Project Logistics Market: Classification of Project Cargo by Dimension, FY 2014



Source: Frost & Sullivan research

Key Restraints for Project Logistics Market in India

Delays in Project Execution

Infrastructure projects that require project logistics services are often large-scale developments that involve multiple shareholders, sometimes including multiple state governments, private entities and international investors. Delays in such projects can be caused because of disagreements between shareholders, or a cash crunch. The progress of large-scale projects is often contingent on approvals from several ministries and state departments where procedural and bureaucratic delays are known to stall projects. Some of the common hindrances for project logistics services are customs clearance delays, approvals from Highways authorities, and lack of cooperation for government authorities.

Significant Gap in Planned vs Actual Investments in Projects

Investment plans are known to be ambitious and laid out based on the needs of specific infrastructure and on the investment capability of the public and private parties. However, as a result of the slowdown of the Indian economy in FY 2013 and FY 2014, the actual investments planned for these years is expected to be significantly lower than the planned investment as per the 12th Five Year Plan. With the election of a new government and the general heightened business sentiment in the country, as well as when the economy recovers, it is expected that investments in infrastructure will catch up, but still lag as compared to the planned investment.

Competition Scenario

The Indian Project Logistics market has relatively lower number of participants within ODC related services, but is highly fragmented within Non-ODC related services, in both transportation and storage segments, most of whom offer standalone transport or storage services.

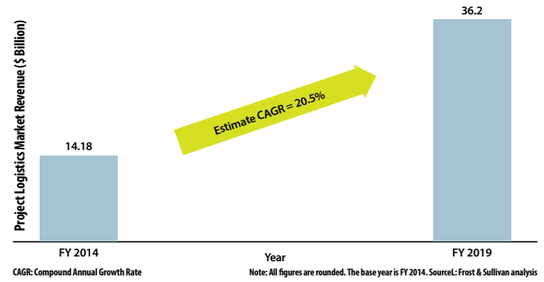
Based on infrastructure, organizational capability, geographical presence, and investment capability among companies, the organized service providers are categorized into fully organized and partially or semi organized. Very few pan-India service providers exist, among which about three to five offer integrated services. The smaller organized service providers can offer services within a limited geographical coverage. In an industry that is driven by customer needs, end-user companies prefer to work with service providers that have scalable assets and service capabilities. Allcargo Logistics, NTC Logistics, Lift & Shift are among the few notable organized project logistics service providers in the country.

While large organized end-user companies prefer to collaborate with organized project logistics service providers, a large number of unorganized participants, particularly in sectors like manufacturing and transportation infrastructure prefer unorganized project logistics service providers.

Revenue Forecasts and Outlook

The total project logistics market in India was estimated to be around US$14.18 billion in FY 2014. The market for project transportation services is estimated to account for just over half of the total project logistics market in India. This is because of the fact that in typical project logistics assignments, the transportation activity is often the most complex as it involves the use of heavy-duty purpose-built equipment that are to be operated by specially trained personnel. Project freight forwarding services account for the second-largest share of the pie because of India's high dependence on imports for high-end machinery and equipment. Furthermore, project cargo at times warrant for the use of special purpose-built vessels, the chartering of which further inflates that freight forwarding costs. The most significant contributing end-user sectors to the project logistics market are manufacturing, transportation infrastructure, and power generation.

The market is likely to reach US$36.20 billion by FY2019, witnessing a Compound Annual Growth Rate (CAGR) of 20.5 percent during the period FY 2014 - FY 2019.



CAGR: Compound Annual Growth Rate

Note: All figures are rounded. The base year is FY 2014. Source:: Frost & Sullivan analysis

Conclusion

Project Logistics services have high potential in India due to major supporting initiatives from the Government and other driving factors. However, factors restraining the realization and investments in projects pose challenges for service providers, which need to be addressed by offering economically priced services and building efficiencies. Transportation segment is likely to retain a larger share within the total market but freight forwarding is likely to gain share owing to high focus on importing specialist equipment for projects. Considering that the current status of project logistics industry in the country is still nascent, the future only looks brighter over a long-term for participants of this industry.

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