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Indian Standard

SPECIFICATION FOR CONCRETE SPREADERS

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INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110001

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Indian Standard

SPECIFICATION FOR CONCRETE SPREADERS

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(*Continued on page* 2)

(*Continued from page* 1)

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Indian Standard

SPECIFICATION FOR CONCRETE SPREADERS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 8 February 1974, after the draft finalized by the Construction Plant and Machinery Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 Rapid industrialization has necessitated far reaching improvements in the techniques of construction of concrete roads and airfields. Machinery is paying an ever increasing role in the speedy and efficient construction of concrete roads and airfield pavements capable of carrying heavy loads and very high speed traffic, and the use of concrete pavers, spreaders and finishers for the purpose is becoming popular. This standard is intended to deal with the essential features of concrete spreaders to serve as guidance to both manufacturers and purchasers. Concrete pavers and finishers are covered in IS : 7245-1974* and IS : 7251-1974† respectively.

0.3 Concrete spreaders are used in advance of the concrete finishers to spread concrete mixtures as poured by the pavers in the construction of paving-strips for roads or airfields. The resulting surface may be flat or crowned, for finishing as a concrete surface, or rough for later application of asphaltic compounds.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960‡. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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1. SCOPE

1.1 This standard lays down requirements regarding materials, design, construction, capacity and performance of concrete spreaders.

*Specification for concrete pavers.
†Specification for concrete finisher.
‡Rules for rounding off numerical values (*revised*).

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions shall apply.

2.1 Finger Type Concrete Vibrator — A series of immersion type concrete vibrators mounted on a horizontal frame with control arrangements for readily raising or lowering the vibrators and for changing the inclination of the vibrators to the horizontal frame.

2.2 Spreader — A machine designed to spread concrete into a continuous uniform slab between forms leaving a uniform surface for the finisher.

3. MATERIALS

3.1 The materials for different components of the spreader shall conform to the requirements of appropriate Indian Standards.

4. TYPES

4.1 The type of the spreader shall be indicated by the arrangement provided for spreading the concrete distributed in its path.

4.1.1 *Reciprocating-Blade Type* — A machine equipped with a reciprocating blade which pushes the concrete (dumped on the formation in front of the machine) forward and sideways as the machine travels along the forms. The blade is turned through 90° at the end of each stroke so that the concrete is moved evenly to both sides of the lane.

4.1.2 *Screw Type* — A machine in which a horizontal screw with a large pitch is used to move the concrete sideways from heaps dumped on the formation in front of the machine. By reversing the screw the concrete is moved to one side or the other of the lane, the action being continued until a uniform surface is obtained.

4.1.3 *Trough-Hopper Type* — A machine consisting of an open bottom trough-hopper mounted on a chassis running on the forms and capable of being moved transversely or longitudinally over the formation to spread the concrete placed on the formation by the paver bucket or side tipping truck. The height of the hopper shall be adjustable to deal with different amounts of charge.

5. SIZE

5.1 The size of the spreader shall be designated by the minimum and maximum limits in metres, of its operating width.

5.1.1 The common sizes of the machine shall be as given below:

a) Reciprocating Blade Type
   3 to 4·5 m
   6 to 7·5 m

b) Screw Type
   3 to 4·5 m
   6 to 7·5 m

c) Trough-Hopper Type
   2·5 to 6 m

5.1.2 Sizes other than those specified in **5.1.1** may be supplied if agreed to between the purchaser and the manufacturer or the supplier.

5.1.3 For all sizes the operating width of the spreader shall be adjustable by increments of not more than 150 mm.

6. CONSTRUCTION

6.1 General — The concrete spreader shall be a complete, self-contained self-propelled machine, designed to progressively spread and compact freshly mixed and poured concrete while following a prepared course of steel and concrete slab form in straight and curved patterns. It shall consist of a spreading blade screw or a trough-hopper carried by an adjustable chassis. The chassis shall be mounted on flanged or flat tyred wheels, and shall be capable of moving on road forms or flat surface.

6.1.1 The spreader shall have a control station mounted on the frame from which one man can control and view all operations.

6.2 The various components shall conform to the requirements given in **6.3** to **6.8**.

6.3 Chassis — The chassis shall be of structural steel construction and shall be so constructed as to permit continuous variation in the working width of the machine within the required ranges (*see* **5.1.1** and **5.1.3**). The adjustment of the frame width shall be accomplished by bolting the end-trucks to the transverse frame members at the required widths or by adjusting telescopic frame members to the required widths. Suitable locking arrangements shall be provided to enable the machine to be operated at any desired width within the specified range (*see* **5.1.1**).

6.3.1 The chassis shall be constructed to support the various parts of the spreader which shall be held in alignment during operation or when an adjustment in width is made. Non-skid steel plate or steel grating shall be furnished to provide access from either side of the spreader to the operating position.

6.3.2 The chassis shall be mounted on four to six power driven flanged or flat tyred wheels. Means shall be provided at each corner of the spreader for holding the spreader in an elevated position for changing wheels or installing on transportation trucks. In case of flanged wheels, suitable arrangements shall be provided for replacing them by flat tyred wheels if necessary.

6.4 Scrappers — Suitable scrappers shall be provided to scrape concrete from the top of the forms in front of the traction wheels and from the wheels.

6.5 Operator's Station — The operator's station shall have a deck made of non-skid steel plate of the raised pattern or expanded metal type. Steps and walkways made of non-skid steel and grab rails shall be attached on each end of the spreader to provide access to the operator's station. All controls shall be grouped at a single centrally located operating station and assembled so that the entire range of performance is in view of and conveniently controllable by one operator. The range of control shall include, but not be limited to clearing and following the prepared course, engine speed, elevation adjustment, and operation of spreading, screeding, and vibrating members, forward and reverse speed ratios, clutches, and brakes.

6.6 Spreading Blade — The spreading blade shall be capable of spreading the concrete uniformly to the required depth and pushing in excess concrete ahead of it. The spreading members shall be either of the reciprocating blade type or of the dual opposing helical screw type and shall be capable of spreading concrete from form to form at all specified width ranges.

6.6.1 When a blade type spreader is furnished, the blade shall reverse automatically at each end of its travel. The blade shall be chain driven and shall be attached to the chain by bolts.

6.6.2 When a dual opposing helical screw type spreader is furnished, each side of the screw shall be individually controlled and shall be reversible. The helical screws shall have replaceable wearing faces made of abrasion-resistant steel. The faces shall be attached to the screws by bolts.

6.6.3 Both types of spreading members shall be adjustable for height from 110 mm below the top of the form to not less than 50 mm above the top of the form and their angle shall be capable of being set in any desired position. A gauge indicating the elevation at which the spreading member is operating shall be provided and located with in view of the operator's station.

6.7 Trough-Hopper (Alternative to Spreading Blade or Dual Opposing Helical Screw, *see* **6.6)** — The trough-hopper shall be not less than 4·5 m in length and 2 m in width and shall be fitted with cross-members capable of breaking the concrete into the hopper and thus helping to reduce any tendency to pre-compaction during transport from the mixer. One side of trough hopper shall be adjustable for loading from the tipping truck at a height of 1 to 1·25 m. The height of the hopper shall be adjustable so that the spreading level may be varied from 50 mm above to 210 mm below the top of the road form level. It shall be capable of spreading concrete in one or two layers as required.

6.7.1 Bottom edge of the machine frame shall be 50 mm above the top flange of the running rail and an adjustment in the range of 130 mm above and 50 mm below this position shall be obtainable by means of height adjustability of the running wheels.

6.7.2 Lateral movement of the hopper shall be controlled by an automatic lifting clutch at a speed of 50 m/sec.

6.8 Strike-off Plate — A steel strike-off plate shall be provided and shall be so constructed that adjustment can be made to shape concrete to the required height and crown allowing a slight excess for compaction by vibrator. The plate shall be provided with hydraulic controls for elevation settings from 200 mm below to not less than 75 mm above the top of the form and crown adjustments of up to 50 mm.

6.8.1 Where a separate strike-off plate is not provided in the trough-hopper type spreader, the hopper itself shall be so shaped as to act as a strike-off plate. In this case, the height adjustability of the bottom of the hopper shall be the same as the adjustability of the hopper itself (*see* **6.7**).

6.9 Steering — A steering mechanism shall be provided to permit squaring the spreader with the forms within the full range of grades and curves encountered in paving operations. The steering mechanism shall consist of power release and breaks on the traction output shafts of the transmission for each side of the spreader. The steering mechanism shall be arranged so that disengagement of the traction drive shall simultaneously apply the brakes, thus stopping and holding the spreader at any point along the forms. The spreader shall be capable of negotiating curves from a minimum radius of 30 m on any grade encountered in paving operations.

6.10 Traction Wheels — The traction wheels shall be steel or composition tired, and suitable for operation under the following three conditions:

a) Between steel forms,

b) Between steel forms and concrete closure slabs, and

c) Between two concrete closure slabs.

Demountable rims may be furnished; when furnished, the rims shall be easily removable without removing wheels. All wheels shall be power-driven.

6.11 Vibrator — Unless otherwise specified, a vibratory attachment shall be furnished as an integral part of the spreader. The vibratory attachment shall consist of two parts. One part, for use in slabs 300 mm or less, shall consist of steel plate pans suspended from a transverse structural frame by means of links and springs, and shall include a hydraulic lifting mechanism which shall be positive in operation and capable of raising or lowering the vibratory attachment and its entire structural supporting frame. The other part, for use in slabs from 300 to 600 mm shall be a set of vibratory adjustable to within 50 mm of the subgrade, operable at any desired depth within the slab, or completely withdrawn from the concrete as required. A drive mechanism shall be furnished which shall develop not less than 3 600 revolutions per minute. The driving forces shall be communicated to the vibratory unit through a medium which shall transmit an acceptable vibrating action to the concrete in the slab being prepared. The spacing of the vibrating tubes shall not exceed 750 mm centre-to-centre, and the two outside tubes which shall be of the spud type adjustable to within 150 mm of the form, shall be operated at frequencies of not less than 4 100 cycles per minute and amplitude such that vibrations will be noticeable 450 mm from the vibrator when vibrator fingers are inserted into concrete to maximum depth. Provision shall be made to discontinue vibration when machine is brought to a stop. The vibrator shall be capable of being engaged when the machine is not moving.

6.12 Power Unit — The spreader shall be powered by a suitable diesel or petrol engine conforming to appropriate Indian Standards. The engine power and speed required by the power while spreading and vibrating at maximum capacity shall not exceed the net continuous 'output power kilowatt' rating of the engine at the applicable speed. The engine shall be furnished complete with the accessories necessary for operation. Such accessories shall conform to the engine specification and shall include the following:

a) A fuel tank of sufficient capacity for not less than 8 hours rated load operation,

b) A housing,

c) An instrument panel with the following instruments:

1) Lubricating oil pressure gauge,

2) Cooling liquid temperature indicator,

3) Battery charging indicator,

4) An hour meter, and

5) A fuel gauge.

The instruments shall be so located that they are visible to the operator in his normal operating position except that the hour meter may be mounted on the engine accessory housing.

d) Unless otherwise specified, and electrical and manual cranking system shall be furnished.

When specified, a hydraulic cranking system consisting of a hydraulic cranking motor, a piston type accumulator, an oil reservoir, an engine-driven pump, a hand-operated pump, and all connecting lines, valves, and fittings to make a complete installation shall be furnished in lieu of the electrical cranking system.

e) When electric cranking system is furnished, an 18-ampere charging generator shall be provided.

6.12.1 *Battery Box* — When an electrical cranking system is furnished, the spreader shall be furnished with a weatherproof battery box provided with drain and shall be constructed of steel sheet not less than 2 mm in thickness. The box shall be designed for batteries conforming to relevant Indian Standards, and shall have a positive clamping device to hold the batteries in place. The battery hold-down arrangements shall be installed so that pressure will be exerted only on the ends or sides of the battery case. The box shall be located so that the batteries will be accessible for routine maintenance, removal, and replacement. The battery electrolyte level shall be visible when the battery filler caps are removed, and the batteries shall be accessible to conventional battery servicing aids such, as a hydrometer and a syringe. Grommets shall be provided to protect the battery lead cables.

6.13 Transmission — The transmission shall be of the automotive type with gears running in oil-bath. The transmission shall provide for two forward working speeds, a forward travel speed, and a reverse travel speed. The low forward working speed shall be not more than 2·5 m/min and the high working speed shall be not less than 4·25 m/min. The forward and reverse travel speed shall be not less than 24·5 m/min. Intermediate speeds in all gear ranges shall be accomplished by varying the engine speed.

6.13.1 *Clutch* — The engine shall be connected to the transmission through a manually-operated clutch of the disc type. Clutch shall be capable of transmitting not less than 130 percent of the maximum torque developed by the engine.

6.14 Hydraulic System — The hydraulic system of the spreader shall include a hydraulic pump with suitable drive, a tank and valve unit equipped with a pressure relief valve, valve control levers, pressure gauge, suction and pressure pipe lines with fittings and connections, lifting rams, and brackets for mounting the various parts. The hydraulic system shall be provided with a replaceable filter located in the system so that the oil for any operation shall pass through the filter. The hydraulic oil reservoir shall be provided with an accessible means for determining the level of the oil in the reservoir. All hydraulic hoses shall be supported by metal clips with maximum spacing of 600 mm to prevent chafing.

6.14.1 The hydraulic system shall be so arranged that the valve control levers are located conveniently for the operator.

6.15 Lifting Attachments — The spreader shall be provided with suitable lifting attachments to enable its being lifted in its normal position. The attachments shall be located so that, when hoisted, adequate clearance will exist between lifting slings and all exterior parts of the spreader. Each attachment shall be of sufficient capacity to carry at least 250 percent of the weight being lifted. The attachments for multiple slings shall be designed so that the attached slings will converge at a point not to exceed 575 cm above the lowest extremity of the load when such limitation is possible. Lifting attachments shall be positioned in such direction that the lifting strain will be in line with the longitudinal axis (peripheral plane) of the eye of the attachment. The eye of each lifting attachment shall be not less than 75 mm inside diameter. The spreader members to which pad eyes are attached shall be of sufficient strength to withstand stresses in the amount and direction of pull specified for the pad eye.

6.15.1 When required, suitable reinforcements shall be used to meet the requirements specified above. The following are some examples of such reinforcements:

a) Flat lifting pads shall be bent around the spreader member to give a 90 degree off set and in such manner as to bear against the spreader surfaces opposite to the direction of pull. Where it is not practicable to bend the pad around the member, a bolt or bolts of sufficient capacity shall pass through the pad and spreader members. In all cases, the pad shall be welded to the spreader member.

b) Round stock pad eyes shall be bent around the spreader member in such a manner as to bear against the spreader surfaces opposite to the direction of pull and shall be welded to the spreader. Where this is not practicable, the round stock shall be threaded and passed through the member and bolted and welded on both sides of the member.

6.15.2 A diagram showing the lifting attachments and lifting slings shall be inscribed on a copper-base alloy plate securely fastened to the spreader, with the lifting capacity of each attachment and the required length and size of each sling cable marked thereon. An outline of the spreader showing the centre of gravity shall be provided.

6.16 Tiedown Devices — The spreader shall be provided with suitable, permanently attached devices to permit tiedown of the spreader to the floor or deck of the transportation medium. The tiedown devices shall be of such design, location and number as to enable the spreader to be anchored in such manner as to prevent shifting or movement in any direction. The devices shall be designed to withstand thrusts of the following magnitude:

a) Forward thrust—8G;

b) Rearward thrust—8G;

c) Upward thrust—2¼G; and

d) Sideward thrust—1½G.

(G = cargo weight of spreader)

The tiedown devices shall be located so as to permit easy attachment of cables or turnbuckles. Tiedown devices shall be indicated by a suitable information plate, by stencilling, or other suitable marking of the spreader. The marking shall clearly indicate that the device is intended for tiedown of the spreader on the carrier when transported.

6.17 Control Identification, Safety and Warning Plates — A plate shall be provided for each switch, gauge and control, and at points which require special attention for safe and efficient operation of the spreader. The plates shall be labelled by lettering or other appropriate marking with information as to function, direction of the control, neutral position, safety instructions, and warnings as necessary. Lettering on the plates shall be not less than 6 mm high and the plates shall be attached to the spreader in a manner to ensure permanent affixing.

7. MAINTENANCE ACCESSIBILITY

7.1 The spreader design shall provide convenient accessibility to all component sub-assemblies and parts for maintenance and repairs.

8. INTERCHANGEABILITY

8.1 All replaceable parts shall be manufactured to definite standards, clearances, and tolerances in order that any such parts of a particular type or model having the same functional and performance characteristics can be replaced or adjusted without requiring modification. When practicable, all such parts shall be permanently and legibly marked with the manufacturer's part number.

9. FINISHING

9.1 All exposed parts of the spreader shall be cleaned, treated and painted with suitable anti-corrosive protective paint.

9.2 Fungus Resistance — When specified, electrical connections including terminal and circuit connections, components, and circuit elements, shall be coated with varnish except that:

a) components and elements inherently resistant to fungi or which are hermetically sealed need not be treated, and

b) components and elements whose operation will be adversely effected by the application of varnish shall not be treated.

10. LUBRICATION

10.1 Means for lubrication shall be provided for all moving parts requiring lubrication. All lubrication fittings shall be accessible to a hand grease gun. Pressure lubrication fittings shall not be used where normal lubricating pressure may damage grease seals or other parts. The spreader shall be lubricated prior to delivery with suitable lubricants designed for use in the specified temperature range. The spreader shall be conspicuously tagged to identify the lubricants and their temperature range.

10.1.1 *Enclosures with Integral Reservoir of Lubricant* — Enclosures, such as gear cases and transmission housings, which contain a reservoir of lubricants for the lubrication of the parts enclosed shall be equipped with dip sticks, finger holes, or sight holes to determine the level of the lubricant. Such enclosures shall be equipped with a permanent magnetic type drain plug. Each enclosure shall be equipped with a means for filling the enclosure with lubricant. The drain plug shall be located so that removal of the plug will result in complete drainage of the lubricant from the enclosure. Drainage shall be to the ground when the epuipment is in its normal position. Integral tubes or troughs may be used to convey the lubricant from the drain to the ground. Accessibility to the drain plug, the filling means, and the lubricant level checking device shall be obtained without the removal or adjustment of accessories or parts. Engine housing side panels and plates equipped with hand-operable, quick-disconnect fasteners may be used.

11. SAFETY REQUIREMENTS

11.1 The design shall preclude or minimize hazards to the operator. Rotating, reciprocating, and high temperature parts shall be fully enclosed, adequately guarded, or insulated.

11.2 Automatic braking system shall be provided, so that brakes are automatically applied when the power unit is stopped.

12. REPAIR PARTS, MAINTENANCE TOOLS AND ACCESSORIES

12.1 Such repair parts, maintenance tools, and accessories as are specified shall be furnished. A manual of instructions for maintenance and an illustrated list of spare parts required for replacement shall also be furnished.

12.2 Toolbox — The toolbox shall be made of metal not less than 2 mm thick, the toolbox shall be complete with trunks drawbolt and a lid which shall open not less than 90 degrees. The drawbolt shall be of a type that will keep the lid closed when subjected to vibration or rough travel. The toolbox shall be securely fastened to the spreader, and shall be of sufficient size to hold the tools specified.

13. INSTRUCTION PLATES

13.1 Each spreader shall be equipped with instruction plates, including warnings and cautions, suitably located, describing any special or important procedures to be followed in operating and servicing the spreader. Plates shall be of the copper base alloy.

14. TRANSPORTATION AND POSITIONING EQUIPMENT

14.1 When so required by the purchaser means for transporting the spreader shall be provided. These means shall consist of:

a) two wheeled trucks, one of which has a fifth wheel steer; or

b) two wheeled trucks and a towing hitch.

The transporting means shall be readily detachable from the spreader.

15. PERFORMANCE

15.1 The spreader shall be capable of satisfactorily spreading and vibrating concrete having a slump as low as 12 mm without segregation, in continuous crowned or flat surfaced paving strips, while riding on and following a prepared course of forms. Forward speeds and vibration rate in slabs ranging from 100 to 600 mm thick shall be geared for continuously paving a dual drum 1 000 litres paver discharging at a minimum rate of 1 000 litres per minute. The spreading action shall not disturb steel transverse and longitudinal paving joints. The controls and indicators shall enable the operator to easily control depth and contour of slab and perform the transition from one operation to another smoothly. At the completion of a project, the transportation trucks shall be capable of carrying the spreader over normal obstructions to another site or a storage location.

16. PARTICULARS TO BE SUPPLIED BY THE PURCHASER

16.1 The purchaser shall supply the following particulars to the manufacturers or suppliers while ordering :

a) Type of machine (*see* **4**);
b) Whether a vibratory attachment is required, and if so, whether the vibrator is to be pan type, finger type or both;
c) Working width and variation in width;
d) Output per hour;
e) Whether required to operate at high altitudes;
f) Whether required to be dismantled into transport packs;
g) Type of control, hydraulic or mechanical;
h) Whether the power unit shall be compression ignition type (diesel) or spark ignition type (petrol); and
j) Any other special requirements.

17. MARKING

17.1 Each machine shall have an identification plate permanently affixed to it with the following particulars conspicuously marked on it:

a) Manufacturer's name and trade-mark,
b) Manufacturer's reference number of the machine,
c) Size of the machine,
d) Gross weight of machine,
e) Type of the machine (*see* **4**),
f) Rating of the power unit, and
g) Year of manufacture.

INDIAN STANDARDS

ON

PLANT AND MACHINERY FOR CONCRETE

IS:

1791-1968 Batch type concrete mixers (*first revision*)
2431-1963 Steel wheel barrows (single wheel type)
2438-1963 Roller pan mixer
2505-1968 Concrete vibrators, immersion type (*first revision*)
2506-1964 Screed board concrete vibrators
2514-1963 Concrete vibrating tables
2722-1964 Portable swing weighbatchers for concrete (single and double bucket type)
3365-1966 Floor polishing machines
3366-1965 Pan vibrators
3558-1966 Code of practice for use of immersion vibrators for consolidating concrete
3559-1966 Pneumatic concrete breakers
4184-1967 Steel wheel barrows (with two wheels)
4634-1968 Method for testing performance of batch type concrete mixer
4656-1968 Form vibrators for concrete
4925-1968 Concrete batching and mixing plant
5500-1969 Vibratory roller
5891-1970 Hand operated concrete mixers
5892-1970 Concrete transit mixers and agitators
6433-1972 Guniting equipment

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