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GOVERNMENT OF NEPAL
MINISTRY OF PHYSICAL INFRASTRUCTURE AND TRANSPORT
DEPARTMENT OF ROADS
BRIDGE BRANCH

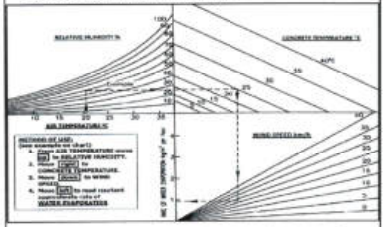
STANDARD SUPERSTRUCTURE DRAWINGS FOR ROAD BRIDGES

15.0m Simply Supported Span, Cast - in - situ,
Reinforced Concrete Slab - Deck
SKEW ANGLE : 0° to 15°
(CARRIAGE WIDTH - 6.0m WITH BOTH SIDE FOOTHPATH - 1.25m = TOTAL WIDTH - 8.50m)

REFERENCE 'NOTES'

1. All dimensions are in millimeters, unless stated otherwise.
2. No dimension shall be scaled from the Drawings; only written dimensions shall be followed.
3. Any doubtful Dimensions/Descriptions shall be brought to the attention of the Engineer-in-charge for any corrections (if any) before execution of work.
4. Number of reinforcement bars shall not be counted from the Drawings. Only given spacing and/or specified numbers of bars, shall be provided.
5. All materials and workmanship shall be in accordance with these NOTES and those in the stated Drawings and shall be generally in accord with the applicable Specifications and relevant Standards/Codes of Practice specified therein and Sound Engineering Practice, in that order.
6. This Bridge Superstructure is designed for One Lane of IRC Class 70R Loading. Two Lanes of IRC Class A Loading, and One Lane of IRC Class A Loading, whichever governs, in addition to a Footpath Live Load corresponding to 500 kg/m. 2/ of Footpath area as per Clause 206.3 of IRC - 6 (2017). However, the precast Footpath slab has also been designed for a wheel Load of 4 Tones (distributed over a contact area of 300 mm dia.) as per clause 206.4 of IRC - 6 (2017), allowing 25% increase in stresses due to flexure.
7. The Contractor shall be responsible for constructing and maintaining all parts of the structure in stable, acceptable and serviceable condition, ensuring no part under construction is unduly stressed and unsafe.
8. **CONSTRUCTION SEQUENCE:** Entire Deck (i.e. the Superstructure comprising the cast in situ Reinforced Concrete four webbed slab) shall preferably be concreted in one operation in one day for one span. If this is not possible, then the four webs shall be cast one after the other (each up to about 150 mm below the top in/cast) on one day (if possible) otherwise on two successive days, one after the other, along with the Cross Girders, and then the slab cast on the next day. This entire Deck must be cast in-situ on staging in span in no more than three Successive Days.
9. **CEMENT:**
   A. High strength Ordinary Portland Cement 53 Grade, conforming to IS: 12269 or 43 Grade conforming to IS: 8112, capable of achieving the required design concrete Strength and Durability, shall be used.
   B. Cement shall be obtained from approved Manufacturer/s only.
   C. Cement content in the Concrete Mix for Reinforced Concrete shall not be less than 350 kg/m3 and not more than 450 kg/m3
10. **COARSE AND FINE AGGREGATES:**
   A. Maximum size of Coarse Aggregate used shall be 20mm. Fineness Modulus of Sand (Fine Aggregate) shall not be less than 2.3. Both these Aggregates shall be of Approved Quality, from Approved Sources, and of Approved Gradations, etc. conforming to IS: 383 (1970). In zones of congestion in the structural sections, if absolutely necessary 12 mm. down sized Coarse Aggregates may be used (but the Mix shall then be re-designed to suit).
   B. In zones of congestion in the structural sections, if absolutely necessary, 12 mm. down sized Coarse Aggregates may be used (but the Mix shall then be re-designed to suit).
11. **ADDITIVES:** To suitably improve workability and increase initial setting time of concrete and cement grout, Admixtures conforming to IS: 9103, and ASTM C-494 Type F water-reducing, high range admixtures, shall be permitted in appropriate dosages, subject to their satisfactory proven use.
12. **REINFORCEMENT:**
   A. All reinforcing steel bars shall be High Yield Strength Deformed type and Thermo Mechanically Treated, having specified minimum 0.2 per cent proof stress of 500 MPa conforming to IS: 1786.
   B. Minimum lap-length of reinforcement bars shall be 65d where d is the dia. of the smaller bar to be lapped (unless otherwise specified).
   C. Not more than 50 percent of reinforcement crossing a section shall be lapped at that location.
   D. All laps in reinforcement shall be properly staggered and minimum distance between the laps shall be 1.3l times the lap length.
   E. Bending of reinforcement bars shall be as per IS:2502.
13. **WATER:** Water for concrete and for its curing shall be of potable quality and presence of any salts, sugars and pollutants like chlorides, sulphates, algae, etc., shall be well within their limits specified in the relevant Specifications.
14. **CONCRETE AND CONCRETING:**
   A. *WATER-CEMENT RATIO*, by weight, shall not exceed 0.45 for Reinforced concrete.
   B. *MINIMUM CLEAR CONCRETE COVER* to reinforcement bars shall be 40mm.
   C. *CONTROL OF SURFACE EVAPORATION*

SURFACE EVAPORATION FROM PLASTIC CONCRETE



Use the graphical Figure below to estimate and control the loss of water through surface evaporation in the laid concrete: one Or more of the following actions shall be taken to reduce the surface evaporation rate to no more than one kilogram of water per square meter of surface area per hour:

i. Construct Windbreakers to effectively reduce the wind velocity (to suit) in the area of concrete placement. The construction of windbreakers or enclosure should not proceed without approval of the Engineer with respect to their structural design relative to safety, stability, adverse loads, and vibrations in the false work.

ii. Install stationary Fog Sprayers upwind of the concreting operation to effectively increase the relative humidity in the area of concrete placement.

iii. When necessary, effectively reduce the temperature of concrete (to suit) by cooling one or more of its components as well as lightly spray wet the shutters and the bad reinforcements. Ice, if added to the mix-water, shall be completely melted prior to using that water.

D. GRADES OF CONCRETE

The structural concretes involved in this Bridge Deck shall be suitably designed as High Strength Concrete Mixes having 28 days minimum works Cube Crushing Strength in Compression on 150 mm Standard Cubes as follows:

• For the cast in situ (cls) Reinforced Concrete 3-Webbed Slab Superstructure (i.e. for its Stems/Girders, Slab and Cross-girders)	**35 MPa** ***(i.e. M-35 Grade Concrete)***
• For the Reinforced Concrete in- - Precast Footpath Slabs - Parapet Posts and their Bases - Road Kerbs	**35 MPa** ***(i.e. M-35 Grade Concrete)***

E. CONSTRUCTION JOINTS:

i. As far as possible the location of Construction Joints shall be as shown in the Drawings, but if not shown on the Drawings but found absolutely necessary, they shall be planned in advance and the placing of concrete carried out continuously from Joint to Joint.

ii. A Construction Joint should not be located near the centroid level of the section as here transverse SHEAR stress is highest. The Joint should be nearly perpendicular to the principal lines of tensile stress and in general be located at points of minimum Shear and minimum Moment - as far as possible.

iii. Where dowels, reinforcing bars, or other adequate ties are not shown at Construction Joints in the Drawings, 'keys' should be formed at reasonable spacing by embedding water-soaked beveled timbers while the concrete is still soft.

iv. These keys should be sized as may be shown in the details, or as directed by the Engineer, and these key-forming timbers shall be removed when the concrete has initially set.

v. In resuming concreting work, the surface of the concrete previously placed shall first be thoroughly cleaned of dirt, scum, laitance, loosely projecting aggregates and any other soft material, using stiff wire brushes, and – if deemed necessary by the Engineer – by sand blasting.

vi. The concrete surface shall then be thoroughly soaked with clean water (just before further concreting) and the free water, etc. air-blown away, and the cleaned concrete surface painted with a thin layer of cement slurry, and only then further concrete poured.

vii. 'Wire-mesh' and other similar items do not provide a proper construction joint, and they shall not be used.

F. COLD JOINTS:

i. When a planned 'continuous' placement of concrete in any structural member is interrupted or delayed, for any reason, for a period long enough for the previously partially placed concrete to take its initial set, the Engineer may declare such a joint as a Cold Joint and the Contractor shall immediately remove the previously partially placed concrete from the Forms.

ii. However, where feasible, the previously partially placed concrete may instead be suitably and carefully hacked and its hacked end brought into 'low shear low moment' zone as far as possible, and given shear key depressions after bringing it nearly perpendicular to the principal lines of tensile stress (for example: brought to vertical or nearly vertical in a beam with principal bending reinforcement horizontal) and thereafter same treatment shall be given to it as to a Construction Joint and only then the concreting resumed (making sure all reinforcements are as per the approved Drawings and the Shuttering has been brought to line and plumb tightly).

G. CURING AND PROTECTION OF YOUNG CONCRETE:

i. All structural concrete shall be cured for a period of time required to obtain the specified strength, but for not less than fourteen consecutive days (and nights) beginning immediately after 'initial setting' of concrete (which is when it loses its surface sheen).

ii. Curing (Membrane-curing or Water-curing) of laid concrete shall be carried out as generally explained below:

III. Membrane-Curing the Concrete:

iii.a. Except for all Construction Joints and surfaces sealed by Forms, liquid membrane curing compound can be used (for curing the concrete) as follows:

iii.b. On bridge deck top surface and other exposed surfaces, liquid membrane curing compound shall be applied soon after Initial Setting and as the Surface Sheen has disappeared and the concrete is still slightly damp (not wet).

iii.c. On shuttered i.e. formed vertical surfaces, Forms shall be stripped as soon as practical (generally after 24 hours of casting) and liquid membrane curing compound applied immediately except in the areas that require rubbing or finishing during the curing period.

iii.d. These areas shall be kept water-wet until their finishing is completed, where after the liquid curing membrane shall be uniformly applied on them also when their surface is damp.

iii.e. White-pigmented liquid membrane curing compound shall be used for all surfaces where the structure temperature during curing period is likely to reach about 35°C or more.

iii.f. For bridge decks which are to receive an asphaltic overlay, residual curing membrane (after curing) shall be removed prior to the overlaying.

iii.g. Removal methods and results should be approved by the Engineer.

iii.h. The membrane curing compound used shall be of longer lasting duration and in accordance with the requirements specified for curing membrane material, AASHTO M 148 or the equivalent IS Specification.

iii.i. The curing membrane shall be applied in two applications one immediately following the other.

iii.j. The rate of each application of curing compound shall be as prescribed by the manufacturer, with a spreading rate per application of at least one liter of liquid per five square meters of concrete surface.

iii.k. If the concrete has dried up or has become dry, it shall be thoroughly wetted with water and the curing compound applied just as the surface film of water disappears and the surface is damp.

iii.l. During curing operations any unsprayed surfaces shall be kept cured with watered Hessian cloth, and sprayed with the curing compound when Surface is damp (not wet).

iii.m. Any curing membrane material on Construction Joints and/or on reinforcing steel shall be completely removed before the following concrete pour.

iii.n. Hand operated spraying equipment shall be capable of applying constant and uniform pressure to provide uniform and even distribution of the curing membrane at the rates required.

iii.o. The curing compound shall be kept thoroughly mixed at all times during usage / application.

iii.p. No traffic of any kind shall be permitted on the curing membrane until the curing period is completed, design permitting.

Iv. Water-Curing the Concrete:

iv.a. All concrete surfaces, unless still sealed by unreleased Forms (which shall be kept from heating-up under ambient temperature) or submerged, shall be water-cured (unless liquid membrane cured).

iv.b. Water curing shall begin just after initial setting of concrete (which generally occurs by about 60 minutes of placement of un-admixture concrete and by about 120 to 180 minutes of placement of admixture concrete) and just after the surface water sheen has disappeared.

iv.c. Surfaces water-cured shall be covered with wet sand, cotton mats, or double-thickness burlap (Jute/Hessian) sheets.

iv.d. This Hessian material shall be placed tightly around and behind any projecting reinforcing steel in order to completely cover the fresh concrete surface.

iv.e. The Hessian material shall be completely saturated with water and kept continuously saturated throughout the curing period.

iv.f. After the initial saturation, unless water is kept running, all surfaces shall be covered with thick polythene sheeting or other approved impervious material in order to protect/prevent drying-up of concrete surface being cure continuously.

iv.g. The sheeting shall be weighted down or secured well to prevent moisture-loss but the surfaces of the concrete shall be readily available for inspection of the Engineer (or his Representative).

iv.h. The sheeting material shall be in good repair.

iv.i. Sheeting that contains holes or is otherwise damaged shall be repaired or replaced immediately.

iv.j. The Contractor shall be responsible for thoroughly inspecting and monitoring the concrete surfaces throughout the curing period to ensure continuous wet curing.

iv.k. Additional water shall be pounded on any areas where saturation is reduced.

iv.l. Inspection of curing by the Contractor shall be conducted at least TEN times per day and night for the duration of the curing period - and even more often if ordered so by the Engineer.

iv.m. The Engineer shall be advised of the curing inspection schedule and he (or his Representative) may accompany the workmen to verify the acceptability of curing.

v. 'COLD-WEATHER' CURING:

v.a. When concrete is placed and the air temperature is expected to drop below 5°C during the curing period, the Contractor shall provide suitable measures such as straw, additional burlap or other suitable blanketing materials and/or housing and artificial hot-air-curing to maintain the concrete temperature between 10°C and 32°C as measured on the surface of the concrete.

v.b. The surface of the concrete shall be kept moist and warm by the use of an approved warm moisture barrier such as warm wet Burlap/Hessian.

v.c. The moisture barrier should be maintained in intimate surface contact with the concrete during the entire curing period.

v.d. After the completion of the curing during the entire required curing period, the Contractor shall stop the curing and remove the protection in such a manner that rapid cooling of the concrete will be prevented.

v.e. When concrete is placed in 'cofferdams' and subsequently flooded with ground water, the above curing conditions may be waived, provided the surface of the water is not permitted to freeze/thy.

H. "CONCRETING" IN "ADVERSE WEATHER" CONDITIONS:

i *'Concreting' in "Cold" Weather.*

i.a. Concrete that freezes soon after placing, gains rather low strength and some permanent damage is certain to occur. Therefore, such concrete shall be removed and replaced immediately.

i.b. 'Planning for Protection of fresh concrete' during placement, and until it has attained the minimum properties required for the environment and the loading to which it will be exposed, shall be done well in advance of concreting and approved by the Engineer.

i.c. Appropriate equipment shall be made available in time for heating the concrete materials, for constructing enclosures and for maintaining favorable temperatures even after the concrete is placed.

i.d. Concrete shall never be placed on cold Forms and cold steel.

i.e. When the temperature of these items is below 5°C, the Contractor shall use means to raise their temperatures to above 10°C.

i.f. When faced with prolonged cold temperatures, all aggregates, or mixing water, or both, shall be heated to about 25°C to 32°C.

i.g. At temperature at least 10°C above freezing, it is seldom necessary to heat the Aggregates.

i.h. At temperatures below or at freezing, often only the Fine Aggregate is heated to produce concrete of the required temperature, provided the Coarse Aggregate is free of frozen lumps and the Temperature of Water for the Mix is at least 10°C.

i.i. If aggregate temperatures are above freezing, the desired concrete temperature usually can be obtained by heating only the mixing water.

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STANDARD SUPERSTRUCTURE DRAWING FOR ROAD BRIDGES

Road Carriageway Width: 7.50m with 1 Footpaths each 1.00m wide	**Overall Deck Width: 11.00 m**
Effective Simply Supported Span (center to center of Bearings): 18 m Reinforced Concrete Deck (no SHEM)	LIVE LOAD: IRC 1 Lane of 70R or 1 or 2 Lanes of Class A, whichever governs, and Footpath Loading

Drg. No.: 1/7 of 4-Webbed RC-Slab-Deck 15.0 m-SS Span

Drg. TITLE : REFERENCE NOTES (1 Sheets): Sheet 1/2

Reviewed by : Prademan Narsara (Engineer, DoR)		Forwarded by : Rabindra Mishra (SDE, DoR)	Date : June, 2021
Recommendation by : Dipak Shrestha (DDG, DoR)		Approved by : Arjun Jung Thapa (DG, DoR)	Revision : 00

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i.j. Appreciable fluctuation in the mixing water temperature from batch to batch shall not be allowed.

ii. Concreting' in "Hot" Weather:

ii.a. No concrete shall be placed when the ambient air temperature at job site in shade is expected to exceed about 35°C during placement operations.

ii.b. When the temperature of the 'concrete mixture' is expected to exceed about 25°C, a retarding admixture shall be included in the approved mix design since setting time tends to reduce at higher temperatures.

ii.c. The temperature of the concrete mixture immediately before placement shall not exceed 32°C.

ii.d. When the ambient air temperature is above 32°C, all Forms, reinforcing steel, and other contact surfaces shall be cooled to below 32°C until concrete is placed.

ii.e. When such high ambient temperature conditions exist, the most appropriate solution is to resort to evening night-&-morning-time concreting.

ii.f. However, if the above stated precautions are taken to help lower the temperature of contact surfaces and the concrete mix-ingredients are also cooled (explained ahead), concreting can be carried out even during day hours provided the ambient air temperature in shade does not exceed 40°C.

ii.g. Mixers, chutes, belts, hoppers, pump lines, and other production and placement equipment can be shaded.

ii.h. Painted white, covered with (wet) burlap, or otherwise cooled to reduce the effect of the sun's heat.

ii.i. Forms and reinforcing steel can be sprinkled with cold water and covered with wet burlap until controlled concreting commences.

ii.j. Sprinkling the area with water spray, gainfully cools the contact surfaces and surrounding air and desirably increases its relative humidity.

ii.k. This not only reduces the 'temperature rise' of the concrete but also minimizes evaporation of water from the concrete during placement and after casting.

ii.l. For slabs on ground, it is a good practice to dampen the sub-grade the evening before concreting.

ii.m. There should be no standing water or puddles on the sub-grade or inside the Forms when the concrete is placed.

ii.n. The mix water may be cooled by using shaved or crushed ice but only as much ice should be used as will be melted entirely before this water is added to the mix.

ii.o. All water used for making ice and for cooling or sprinkling, and curing, must meet the same quality requirements as those for water used for Mixing of Concrete.

ii.p. Of particular concern are the polluting sulphates and chlorides (salts) in the mix, which can adversely affect the cement and corrode the reinforcing steel, respectively. These must be kept below their specified limits.

ii.q. Aggregates should be cooled by shading and sprinkling water (fog spray).

ii.r. Transporting and placing concrete shall be done as quickly as practical during hot weather.

ii.s. Delays contribute to loss of slump, a damaging increase in concrete temperature and loss of workability.

ii.t. Enough workmen and equipment shall always be available to handle and place concrete immediately upon delivery.

ii.u. Prolonged mixing, even at agitating speed of the Drum, shall be avoided since it might heat-up the mix and reduce workability.

ii.v. If delays occur, the heat generated by continued mixing/agitating can be minimized by stopping the mixer and then agitating intermittently, but the delays shall be kept short.

ii.w. Inch concrete hardens more rapidly in hot weather, extra care in placing techniques is required to avoid Cold Joints.

ii.x. For placement of Concrete in Walls, Shafts, Columns, etc. shallower layers may be required to assure proper consolidation and monolith city with each previous lift, effective dissipation of heat of hydration and to prevent segregation of the mix.

ii.y. Temporary sunshades and windbreakers help to minimize adverse effects of hot weather, winds, and surface evaporation.

G. CAUTION AGAINST "PLASTIC-SHRINKAGE" CRACKING of Concrete AND USING EXCESSIVE DOSAGES OF ADDITIVES like 'RETARDER' and 'SUPER - PLASTICISER'

i. Plastic Shrinkage cracks develop prior to initial setting of concrete and can appear more prominently in slabs. If the rate of surface evaporation from the freshly laid concrete is faster than the rate of upward bleeding through it, the concrete surface tends to dry up, hence shrink, causing cracks in plastic concrete due to tension from this shrinking under such condition. These cracks travel downwards from the surface and their propagation is locked only upon 'initial setting' of concrete.

ii. The longer the initial setting time, deeper will these cracks penetrate. Should they travel down to a significant depth of slab, then the slab can become a bunch of isolated concrete blocks separated by these cracks, and hence not be structurally monolithic with the rest of the Deck-section. Such deep-penetrating crack distress, in all probability, generally is not repairable by Epoxy filling of these cracks. The result may be a major Damage, requiring major rehabilitation.

iii. Hence minimum doses of Retarders and Super-Plasticizers shall be used so as to keep the initial setting time to just the required minimum to allow the required 'workability' of concrete.

iv. These cracks can be of random pattern (alligator-skin pattern) and/or may be somewhat parallel to each other and nearly perpendicular to the direction of wind that prevailed at the time of casting. Hence the field staff must look for these cracks before the concrete has initially set and, should these cracks occur, the plastic concrete should be quickly lightly 're-troweled' on its surface (not re-vibrated) to close these cracks in time.

v. Concrete slabs which are correctly re-troweled should not exhibit Plastic Shrinkage cracks because the action of floating and trowelling is a form of re-compaction that tends to close them as fast as they form. (This trowelling can, however, aggravate sedimentation of solids in the mix and cause Plastic Settlement cracks - see ahead.)

vi. Although the Plastic Shrinkage cracks can be wide at their start (even up to 2 mm), the width rapidly diminishes with depth. Nevertheless, in severe cases they may pass through the full depth of a slab, in contrast with most types of Plastic Settlement cracks. If not noticed in the soffit of not-easily-accessible-slab-soffits, thorough wetting at the top of the slab may show them in case of full depth penetration. Taking cores can reveal them precisely.

vii. Plastic Shrinkage cracks rarely reach the free ends of the slab (e.g. the edges of a slab) because these edges are free to move under plastic shrinkage. This is a very important way of differentiating them from long-term drying shrinkage cracks if the time of formation is unknown. However, Plastic Shrinkage cracks will form up to the ends of a slab which has been cast against a previous pour, especially if there is continuity of steel, because this acts as restraint.

viii. The factors that determine rate of surface evaporation are: the temperature of the concrete, the air temperature, relative humidity, and wind velocity of the air adjacent to the concrete. The evaporation increases as the humidity decreases, as the wind velocity increases, as the air temperature decreases, and as the concrete temperature increases. Of particular interest is the fact that rapid evaporation is at least as big a problem in cold weather as in hot weather! Even when the relative humidity be 100 per cent in cold weather, there will be a large amount of evaporation if the concrete is warm! Of all the factors listed above, only the concrete temperature is easily controllable. There is a definite advantage to cool the concrete: it shall be placed as cool as practical in warm weather and should not be overheated in cold weather. If the concrete temperature is reduced to about 27°C to 15°C, much of the evaporation can be eliminated!

ix. In hot weather, sometimes concreting during 4 p.m. on the previous day up to 12 noon on the next day may be resorted to for preventing formation of Plastic cracks and obtaining better quality concrete. But this will be effective only if it gives significantly lower concrete temperatures and lower wind velocity. The reduction of air temperature BUT not that of concrete (even with the increase in relative humidity) will not significantly reduce the Plastic Shrinkage cracking.

x. If it is not possible to eliminate the risk of Plastic Shrinkage cracks even by improved timely curing, then changes to the concrete mix must be considered. First, check that the concrete does not contain an admixture with high retarding effects. If it does, try to reduce it or replace it with the one that does not retard so much (rather than counter it by adding a compensating accelerator!). Second, consider the use of air entrainment. Air-entrained concrete exhibits less Plastic Shrinkage cracks than plain concrete. At first sight this might seem illogical because as air entrainment reduces the rate of bleeding it should increase the risk of Plastic Shrinkage cracks occurring at a given rate of evaporation. However, most commercially available air-entraining agents are 'detergents' and therefore reduce the surface tension caused by drying, and consequently reduce the shrinkage cracking.

xi. The prevention and timely repair of Plastic Shrinkage cracks in slabs is particularly critical. This is because the cracks are wide at the top and can rapidly take in pollutants which may cause subsequent spalling and prevent the subsequent satisfactory application of sealing materials. Clearly wide cracks in slabs are not likely to be self-healing at the top and are likely to spall and allow ingress of pollutants.

H. CAUTION AGAINST POSSIBLE DAMAGE DUE TO "PLASTIC SETTLEMENT" CRACKING OF CONCRETE

i. Plastic Settlement cracks occur in not-yet-initially-set concrete when there is a relatively high amount of bleeding through it and some form of obstruction to the downward sedimentation of its solids (e.g. the reinforcement bars). These obstructions 'break the back of the settling concrete' over them as its solids fall downwards around them, fomenting formation of hollows under their 'belly'. Thus Cracks show directly over formwork-tie-bolts and over reinforcement near the top of the plastic concrete, reflecting their pattern. Such Cracks can also appear in narrow columns and walls where the said sedimentation is prevented by the resulting arching of the concrete due to downward passage for sedimentation and there may be further aggravation by the presence of horizontal bars.

ii. Plastic Settlement Cracks can be prevented by reducing the bleeding and hence the sedimentation, and by reducing the obstructions to sedimentation.

iii. Admixtures such as plasticizers reduce water demand and thus are the most effective way of reducing bleeding and sedimentation and hence the plastic settlement cracks. These can also be eliminated by light re-vibration (not re-trowelling) of the not-yet-initially-set concrete if they have formed, thus also filling back the under-belly hollows.

vi. This light re-vibration shall not be applied too soon otherwise a second phase of bleeding can still cause Plastic Settlement cracks. The correct time can easily be determined by simple site trials: it will be the last time that a vibrating poker can be inserted into the concrete and removed without leaving a significant trace. Re-vibration is often the only way to eliminate plastic settlement cracks, particularly in deep sections. Trowelling the surface can actually aggravate these cracks as the pressure may only cause further settlement of solids!

I. BEWARE OF CRACKS DUE TO "PLASTIC-SHRINKAGE" and "PLASTIC SETTLEMENT" IN CONCRETE WHILE IT IS STILL PLASTIC AND HAS NOT YET ATTAINED "INITIAL SET"

i. Plastic cracks by their very nature pass through the cement matrix and around aggregate particles; therefore they are very rugged and capable of transferring shear, providing there is sufficient reinforcement to maintain aggregate interlock. Consequently full structural repairs (using epoxy formulation) may not be necessary, though preferable....BUT only if the crack penetration is minor BECAUSE otherwise if deep penetration damage is done, EPOXYING WILL NOT restore full monolythicity (in which case the Deck slab may have to be demolished, requiring major and very costly rehabilitation exercise). HENCE BEWARE OF PLASTIC CRACKING!

ii. If cracks follow the pattern of the top reinforcement it may be difficult at first to determine whether they are due to Plastic Shrinkage or Plastic Settlement. If it can be shown that the cracks 'pass through the slab' and follow the pattern of the steel, then they are almost certainly Plastic Shrinkage cracks that have been orientated by the steel!

iii. Plastic cracks often form in the top face of sections e.g., Plastic Shrinkage cracks in slabs, and/or Plastic Settlement cracks on top of deep beams and walls. Thus they can be accessible, and this coupled with the fact that they form so early in the life of concrete, means that they may widen as thermal contraction and drying shrinkage take place. Consequently it may not be wise to fill plastic cracks with 'rigid' epoxy materials until it is certain that the long-term effects have subsided.

iv. Plastic Settlement cracks over steel must be immediately and efficiently 'sealed' if the concrete is in an exposed state (to eliminate the risk of corrosion of the steel). Reduced bond strengths due to under-belly voids thus formed under steel bars are dangerous.

J. ACCEPTABILITY CRITERIA OF CONCRETE CUBE CRUSHING TEST RESULTS FOR APPROVING THE CONCRETE THEY REPRESENT

i. *The acceptability criteria of Standard Cube crushing test results* shall be that not more than 5% of works cubes fall below the specified minimum works strength. For this to be fulfilled, the Mean Strength of works cubes tested at 28 days ageless 1.64 times the "Standard *Deviation*" should not be less than the required minimum 28 day works cube strength.

ii. ALTERNATIVELY (if the Standard Deviation for the concerned Concrete-Mix has not been established), the cube strength shall be accepted as complying with the strength requirement either "if none of the specimens tested falls below the minimum specified strength" or "if the average strength of the specimens is not less than the specified minimum, no individual test result falls below 85% of the minimum required works strength and the difference between the maximum and the minimum strengths of the test specimens is NOT GREATER THAN 20% of that average".

iii. "In case of a dispute about the strength of concrete in a particular area of the cast concrete, three 50 mm dia. and 100 mm. long Standard concrete cores shall be drilled out from such an individual area and tested for their crushing compressive strength. These values shall then be rectified for concrete age and how the cores were cut, and the corresponding equivalent "cube" strengths worked out for each core. If their average exceeds 85% of required 28 days works cube strength and none falls below 75% of the required 28 days works cube strength, then concrete in such disputed area may be accepted - but of course subject to contractual conditions for poor work.

K. RELEASE OF THE STAGING SUPPORTING THE DECK IN A SPAN: After successfully curing the Concrete in the Deck as specified above and the concrete in it attains a minimum works Cube Crushing Strength of 280 kg/cm^2 (age of Concrete approximately 21 days after casting) the staging supporting the Deck may now be released. The Superstructure (i.e. the Deck) shall not be loaded until after its concrete is at least 28 days old and crushing cube strength of its concrete is 350 Kg/cm^2.

L. BEARINGS:

i. NEOPRENE BEARINGS shall be used. Their Material specifications, Design, Acceptance Criteria and Installation shall be generally in accordance with IRC: 83 part 2 (2015), the AASHTO Design Specifications, and Sound Engineering Practice.

ii. The Bearings shall be obtained from approved and experienced Manufacturers.

iii. Installation of Bearings shall be carried out under the expert supervision of the Manufacturer's Technical Representative.

iv. The Design of Bearings shall be based on the Design Loads, Rotations, etc., given in the appropriate Table in the attached relevant Drawing.

v. Detailed Shop Drawings shall be prepared by the Manufacturer, which shall be checked and duly approved before the Bearings are manufactured and installed.

vi. Neoprene Bearings shall be bonded to their R.C. pedestals by appropriate Epoxy Adhesive. (The Grout/Bedding Mortar, where used, shall be high strength free flowing Non Shrink Type.)

vii. All Bearings shall be placed in truly horizontal plane only and to true line and direction (unless shown differently), as generally indicated in the attached relevant Drawing.

viii. In case the contractor wishes to change the type of Bearings from Neoprene to POT Bearings (POT Fixed and POT-PTFE Free), then the magnitudes of Vertical loads, Horizontal forces and movements, etc. tabulated in Drg. No: 6/7 of 3-Webbed RC-Slab-Deck 15.0 m-SS Span will all change and the same will then have to be re-worked out and the design of POT-Bearings done accordingly. The Substructure and Foundations shall then be designed according to the correctly re-worked out Loads, Forces and Movements, etc.

17. **EXPANSION-CONTRACTION JOINTS**

i. These Movement Joints shall be provided in the deck as Specified and shown in attached relevant Drawing. These shall be of Approved Quality and shall be fitted under the expert supervision of the Manufacturer at the appropriate ambient Temperature as per Design.

ii. An other type of expansion joint like compression seal, slab seal etc. that satisfies the requirement as shown in relevant drawing can also be used under the supervision of concerned Engineer.

18. **WEARING COURSE:** Asphaltic concrete / Premix wearing COURSE, 75mm thick at roadway crown, gradually reducing to 50mm at the road Krebs, shall be provided over the Deck Slab.

19. **EARTHQUAKE EFFECTS:** The Horizontal Seismic coefficient assumed is 0.18 (i.e. 0.18G) accompanied by a Vertical Seismic coefficient of + or - 0.12G.

20. **DESIGN CONSULTANT :** Civil Informatics and Solutions (P) Ltd.

Chakupat, Lalitpur, Nepal.

LIST OF DRAWINGS :

DRAWING TITLE	DRAWING NO.
REFERENCE NOTES (2 Sheets): Sheet 1/2	1 of 7 3-Webbed RC-Slab-Deck 15.0m-SS Span
REFERENCE NOTES (2 Sheets): Sheet 2/2	2 of 7 3-Webbed RC-Slab-Deck 15.0m-SS Span
SUPERSTRUCTURE OUTLINE & DIMENSIONS	3 of 7 3-Webbed RC-Slab-Deck 15.0m-SS Span
REINFORCEMENT DETAILS OF DECK SLAB, FOOTPATH SLAB, ROAD KERB & PARAPET POST	4 of 7 3-Webbed RC-Slab-Deck 15.0m-SS Span
REINFORCEMENT DETAILS OF LONGITUDINAL GIRDER	5 of 7 3-Webbed RC-Slab-Deck 15.0m-SS Span
REINFORCEMENT DETAILS OF CROSS GIRDER & MISCELLANEOUS DETAILS	6 of 7 3-Webbed RC-Slab-Deck 15.0m-SS Span
BAR BENDING SCHEDULE	7 of 7 3-Webbed RC-Slab-Deck 15.0m-SS Span

GOVERNMENT OF NEPAL
MINISTRY OF PHYSICAL INFRASTRUCTURE AND TRANSPORT
DEPARTMENT OF ROADS
BRIDGE BRANCH

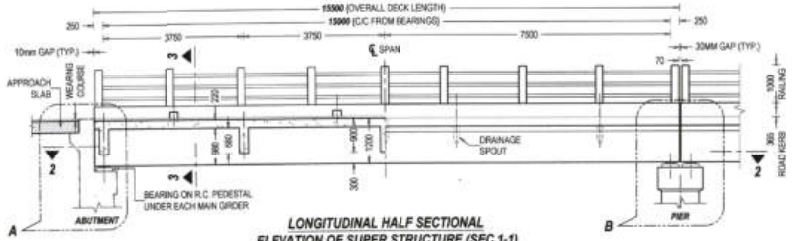
STANDARD SUPERSTRUCTURE DRAWING FOR ROAD BRIDGES

Road Carriageway Width: 7.50m with 2 Footpaths each 1.50m wide	Overall Deck Width: 11.00 m
Effective Simply Supported Span (center to center of Bearings): 15.0 m Reinforced Concrete Deck (no SKEW)	LIVE LOAD: IRC 1 Lane of 70R or 1 or 2 Lanes of Class A, whichever governs, and Footpath Loading
Drg. No.: 2/7 of 4-Webbed RC-Slab-Deck 15.0 m-SS Span	
Drg. TITLE : REFERENCE NOTES (2 Sheets): Sheet 2/2	

Reviewed by: Pradimani Niraula (Engineer, DoR)	Forwarded by: Jitendra Mishra (SDE, DoR)	Date: June, 2021
Recommendation by: Dipak Shrestha (DDG, DoR)	Approved by: Arjun Jung Thapa (DG, DoR)	Revision: 00

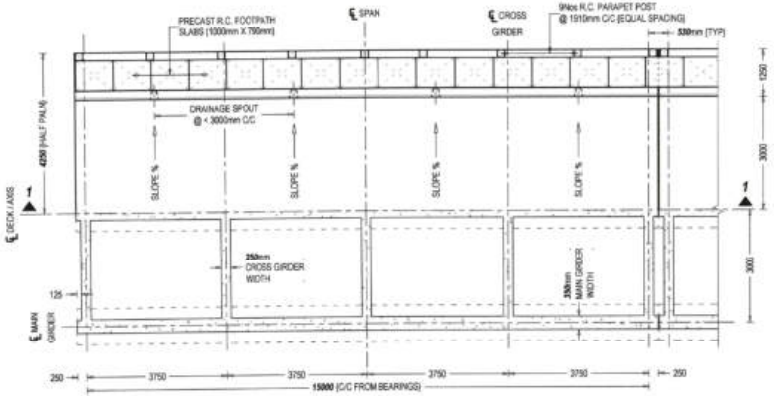
ई. दिपक श्रेष्ठ
उपमहानिर्देशक

ई. अर्जुन जंग थापा
महानिर्देशक



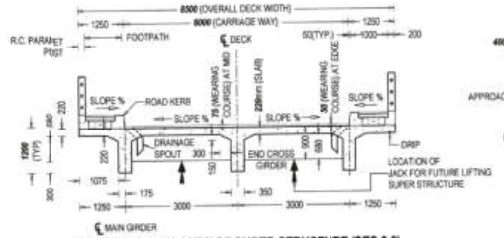
LONGITUDINAL HALF SECTIONAL ELEVATION OF SUPER STRUCTURE (SEC 1-1)

SCALE - 1 : 100 @ A3 PAPER



HALF SECTIONAL PLAN VIEW OF SUPER STRUCTURE (SEC 2-2)

SCALE - 1 : 100 @ A3 PAPER



HALF SECTIONAL VIEW OF SUPER STRUCTURE (SEC 3-3)

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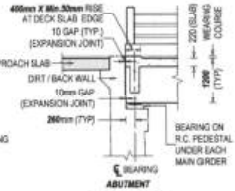
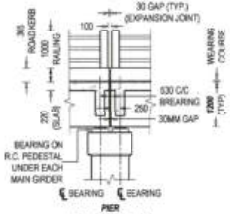


DETAIL AT - A

SCALE - 1 : 100 @ A3 PAPER



DETAIL AT - B

SCALE - 1 : 100 @ A3 PAPER

GENERAL NOTE :

1. ALL DIMENSIONS ARE IN MILLIMETERS, UNLESS STATED OTHERWISE.
2. NO DIMENSIONS SHALL BE SCALE FROM DRAWING. ONLY WRITTEN DIMENSIONS SHALL BE FOLLOWED.
3. MATERIAL GRADE
   A. CONCRETE GRADE : M35
   B. STEEL GRADE : Fe500
   C. COVER : 40mm
4. CHAMFER 15mm x 15mm SHALL BE PROVIDED AT ALL JUNCTIONS OF THE FRAMEWORK UNLESS OTHERWISE SPECIFIED IN THE DRAWING.
5. PROPERLY STIFFENED STEEL PLATES SHALL BE USED SHUTTERING FOR CASTING THE SLAB AND DECK.

S.N.	ITEM		QUANTITY
1.	STRUCTURAL CONCRETE	M35 IN DECK AND SLAB	52.0 CU.M.
		M35 IN FOOTHPATH SLAB, ROAD KERB AND PARAPET POST	10.0 CU.M.
2.	REINFORCEMENT BARS 500 MPa (Fe 500)		13.6 TONNES
3.	ASPHALTIC / PREMIX WEARING COURSE		93.0 SQ. M.
4.	75MM DIA GI PIPE (RAILING)		93.0 M.
5.	DRAINAGE SPOUTS EACH 450mm LONG Ø100mm G.I. PIPE		8 NOS
6.	BEARINGS : ELASTOMERIC BRIDGE BEARING		6 NOS
7.	40mm THICK CONCRETE TILES FOR FOOTPATH		25.0 SQ. M.
8.	EXPANSION JOINT		17.0 R.M.

NOTES:

1. EXACT QUANTITIES SHALL BE CALCULATED BY THE CONCERNED ENGINEER FOR COSTING PURPOSES.
2. TOTAL WEIGHT OF ENTIRE SUPERSTRUCTURE IN ONE SPAN = 176 Tonnes.
3. CONCRETE TILES CAN BE REPLACED WITH M20 CONCRETE IN REMOTE AREAS.

GOVERNMENT OF NEPAL
MINISTRY OF PHYSICAL INFRASTRUCTURE AND TRANSPORT
DEPARTMENT OF ROADS
BRIDGE BRANCH

STANDARD SUPERSTRUCTURE DRAWING FOR ROAD BRIDGES

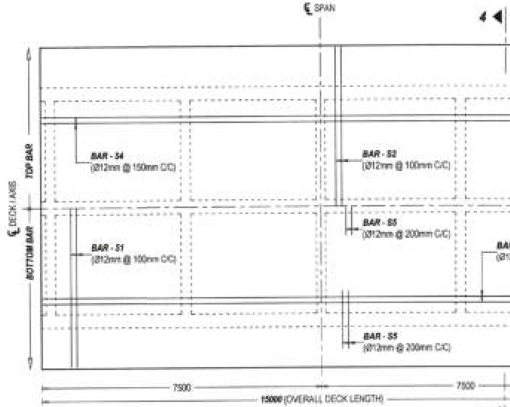
Road Carriageway Width: 7.50m with 2 Footpaths each 1.50m wide	Overall Deck Width: 11.00 m
Effective Simply Supported Span (center to center of Bearings): 15.0 m Reinforced Concrete Deck (no SIDS)	LIVE LOAD: IRC 1 Lane of 70R or 1 or 2 Lanes of Class A, whichever governs, and Footpath Loading

Dwg. No.: 3/7 of 4-Webbed RC-Slab-Deck 15.0 m-SS Span

Drg. TITLE : SUPERSTRUCTURE OUTLINE & DIMENSIONS

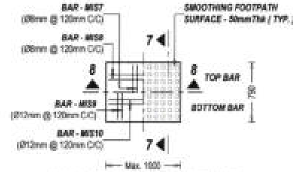
Reviewed by: Pradumani Niraula (Engineer, DoR)		Forwarded by: Jibendra Mishra (SDE, DoR)	Date: June, 2021.
Recommendation by: Dipak Shrestha (DDG, DoR)		Approved by: Arjun Jung Thapa (DG, DoR)	Revisions: 00

दिपक श्रेष्ठ



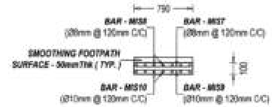
REINFORCEMENT DETAILS OF DECK - PLAN VIEW

SCALE - 1 : 100 @ A3 PAPER



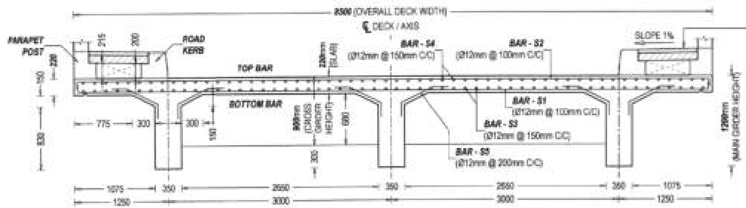
HALF SECTIONAL PLAN VIEW OF PRECAST R.C. FOOTPATH SLAB

SCALE - 1 : 50 @ A3 PAPER



SECTIONAL DETAIL (SEC 7 - 7)

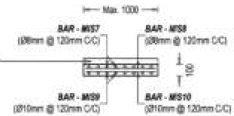
SCALE - 1 : 50 @ A3 PAPER



REINFORCEMENT DETAILS OF DECK - SECTIONAL VIEW (SEC 4 - 4)

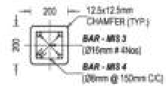
SCALE - 1 : 50 @ A3 PAPER

Concrete Terra Stone Pavestone 400x400x50mm (URBAN AREA) OR M15 / 50 mm Thk Concrete Flooring (SMOOTHING FOOTPATH SURFACE)



SECTIONAL DETAIL (SEC 8 - 8)

SCALE - 1 : 50 @ A3 PAPER

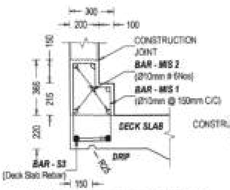


SECTIONAL REINFORCEMENT DETAILS OF PARAPET POST (SEC 6 - 6)

SCALE - 1 : 20 @ A3 PAPER

NOTES:

1. Concrete flooring tiles on footpaths in urban area and bituminous approach road. In other region 50 mm thick M20 Concrete flooring above concrete precast slab can be provided for smooth surface in footpaths.
2. Maximum width of footpath slab is 1.0m and end footpath slab shall be of appropriate size.



REINFORCEMENT DETAILS OF PARAPET POST - SECTIONAL VIEW

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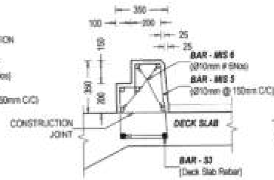
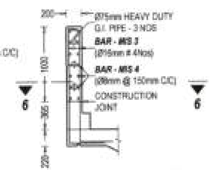


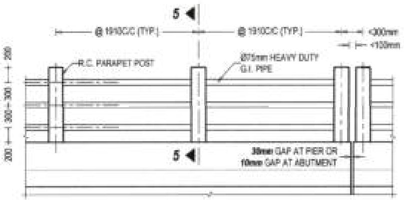
REINFORCEMENT DETAILS OF ROAD KERB - SECTIONAL VIEW

SCALE - 1 : 25 @ A3 PAPER



SECTIONAL VIEW OF POST (SEC5-5)

SCALE - 1 : 50 @ A3 PAPER



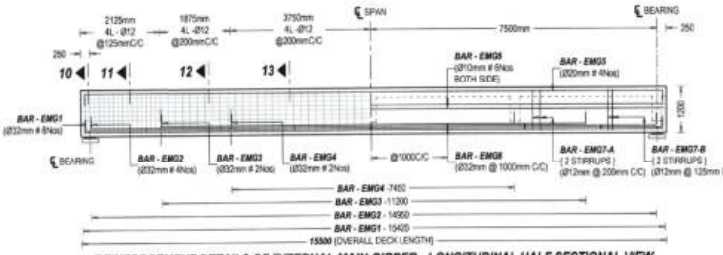
ELEVATION VIEW OF PARAPET POST

SCALE - 1 : 50 @ A3 PAPER

GOVERNMENT OF NEPAL MINISTRY OF PHYSICAL INFRASTRUCTURE AND TRANSPORT DEPARTMENT OF ROADS BRIDGE BRANCH	
STANDARD SUPERSTRUCTURE DRAWING FOR ROAD BRIDGES	
Road Carriageway Width: 7.50m with 2 Footpaths each 1.50m wide	Overall Deck Width: 11.00 m
Effective Simply Supported Span (center to center of Bearings): 15.0 m Reinforced Concrete Deck (no SKEW)	LIVE LOAD: IRC 1 Lane of 70R or 1 or 2 Lanes of Class A, whichever governs, and Footpath Loading
Drg. No.: 4/7 of 4-Webbed RC-Slab-Deck 15.0 m-SS Span	
REINFORCEMENT DETAILS OF DECK SLAB, FOOTPATH SLAB, ROAD KERB & PARAPET POST	

Reviewed by : Pradhmani Niraula (Engineer, DoR)	Forwarded by : Jitendra Mishra (SDE, DoR)	Date : June, 2021
Recommendation by : Dipak Shrestha (DDG, DoR)	Approved by : Mohan Jung Thapa (DG, DoR)	Revision : 00

उप-महानिर्देशक



REINFORCEMENT DETAILS OF EXTERNAL MAIN GIRDER - LONGITUDINAL HALF SECTIONAL VIEW

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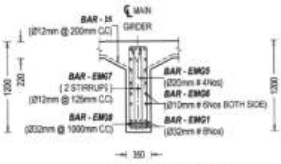

SECTIONAL DETAIL (SEC 10 - 10)

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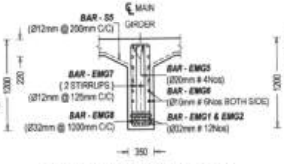

SECTIONAL DETAIL (SEC 11 - 11)

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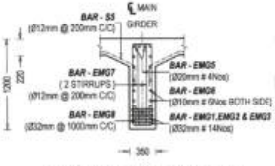

SECTIONAL DETAIL (SEC 12 - 12)

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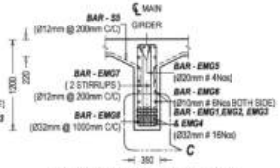

SECTIONAL DETAIL (SEC 13 - 13)

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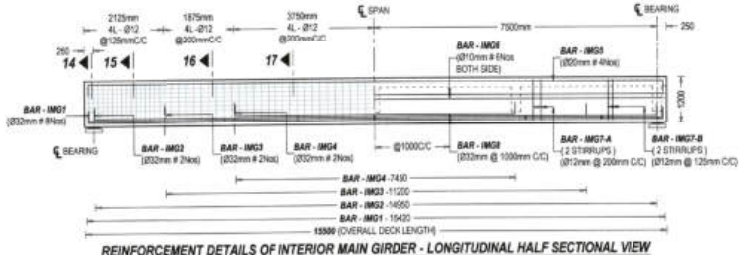

REINFORCEMENT DETAILS OF INTERIOR MAIN GIRDER - LONGITUDINAL HALF SECTIONAL VIEW

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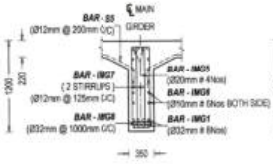

SECTIONAL DETAIL (SEC 14 - 14)

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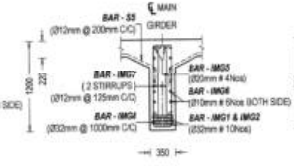

SECTIONAL DETAIL (SEC 15 - 15)

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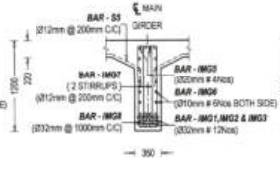

SECTIONAL DETAIL (SEC 16 - 16)

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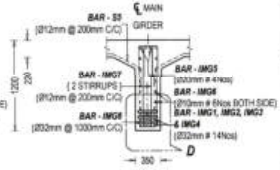

SECTIONAL DETAIL (SEC 17 - 17)

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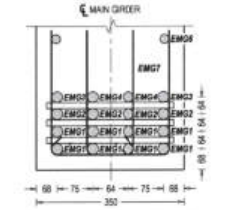

EXTERNAL MAIN GIRDER BAR ARRANGEMENT DETAIL (DETAIL AT C)

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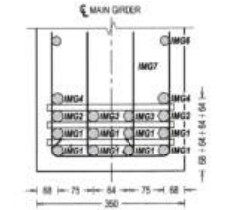


INTERIOR MAIN GIRDER BAR ARRANGEMENT DETAIL (DETAIL AT D)

SCALE - 1 : 10 @ A3 PAPER

GOVERNMENT OF NEPAL
MINISTRY OF PHYSICAL INFRASTRUCTURE AND TRANSPORT
DEPARTMENT OF ROADS
BRIDGE BRANCH

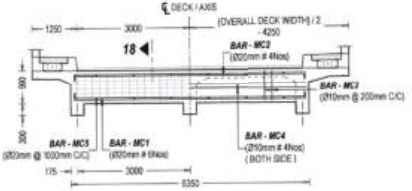
STANDARD SUPERSTRUCTURE DRAWING FOR ROAD BRIDGES

Road Carriageway Width: 7.50m with 2 Footpaths each 1.50m wide	Overall Deck Width: 11.00 m
Effective Simply Supported Span (center to center of Bearings): 15.0 m	LIVE LOAD: IRC 1 Lane of 70R or 1 or 2 Lanes of Class A, whichever governs, and Footpath Loading
Reinforced Concrete Deck (no SIDW)	

Drg. No.: 5/7 of 4-Webbed RC-Slab-Deck 15.0 m-SS Span

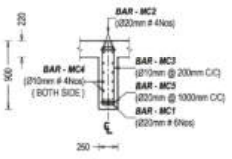
REINFORCEMENT DETAILS OF LONGITUDINAL GIRDER

Reviewed by: Prashmani Nirola (Engineer, DoR)	Forwarded by: Jibendra Mishra (SDE, DoR)	Date: June, 2021
Recommendation by: Dipak Shrestha (DDG, DoR)	Approved by: Arbin Jung Thapa (DG, DoR)	Revised: 00



REINFORCEMENT DETAILS OF MID CROSS GIRDER - LONGITUDINAL HALF SECTIONAL VIEW

SCALE - 1 : 100 @ A3 PAPER



SECTIONAL DETAIL (SEC 18 - 18)

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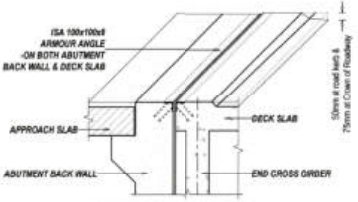
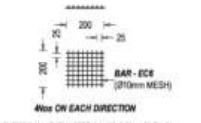


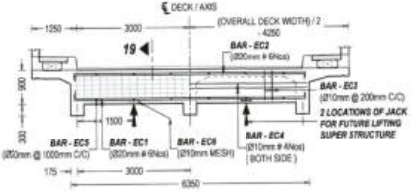
ISOMETRIC DETAIL VIEW OF EXPANSION JOINTS DETAILS AT ABUTMENT

SCALE - NON



DETAIL OF MESH (BAR - EC6)

SCALE - 1 : 50 @ A3 PAPER



REINFORCEMENT DETAILS OF END CROSS GIRDER - LONGITUDINAL HALF SECTIONAL VIEW

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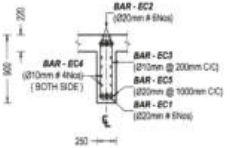

SECTIONAL DETAIL (SEC 19 - 19)

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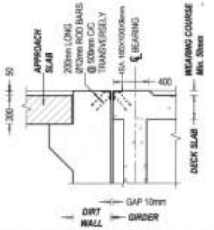
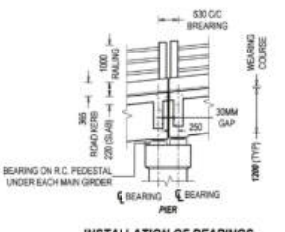


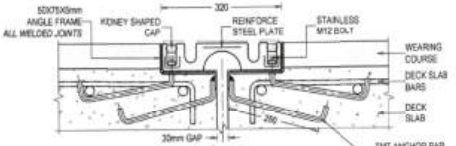
EXPANSION JOINTS DETAILS AT ABUTMENT

SCALE - 1 : 40 @ A3 PAPER



INSTALLATION OF BEARINGS WHEN SUPERSTRUCTURE IS AT GRADE

SCALE - 1 : 100 @ A3 PAPER

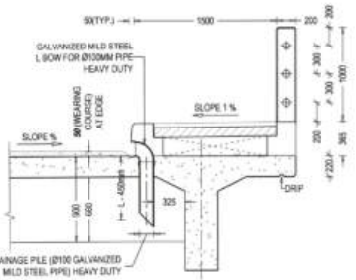


EXPANSION JOINT ISOMETRIC VIEW - SEAL TYPE

SCALE - 1 : NON

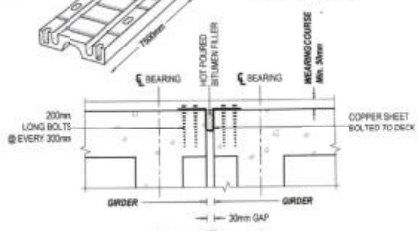
SEAL TYPE EXPANSION JOINTS ARRANGEMENT IN A CARRIAGEWAY

SCALE - 1 : 10 @ A3 PAPER



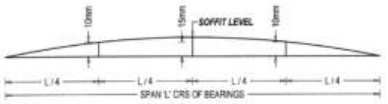
DRAINAGE SPOUT DETAIL

SCALE - 1 : 40 @ A3 PAPER



EXPANSION JOINTS ARRANGEMENT IN A CARRIAGEWAY

SCALE - 1 : 20 @ A3 PAPER



LONGITUDINAL CAMBER PROFILE TO BE GIVEN TO SOFFIT OF DECK

SCALE - NON

Data for Substructure and Foundation Design				
Load Condition	Reaction (kN)			Remarks
	Right Exterior Girder	Inner Girder 1	Left Exterior Girder	
Dead Load (Slab and Girder)	191.83	216.22	191.83	
SIDL, Wearing Course	16.88	33.75	16.88	
SIDL, Railing and Utilities	66.17	Negligible	66.17	
Pedestrian Load	34.34	Negligible	34.34	
2 Lane of IRC Class A	201.21	206.37	211.53	Excluding I.F.
IRC Class 70 R (Tracked)	232.40	197.79	163.18	Excluding I.F.
IRC Class 70 R (Wheeled)	263.91	219.47	175.03	Excluding I.F.

DATA FOR BEARINGS		
Load Condition	Items	On each Neoprene Bearing
Under Maximum Live Load	V	584 kN
	H_L	91 kN
	H_T	59 kN
	θ	0.004484 Radian
	Δ	10 mm

NOTES :

'V' = Vertical Load
'H' = Longitudinal Horizontal Force
'H_T' = Transverse Horizontal Force
'θ_x' = Rotation About Bridge Transverse Axis
'Δ' = Longitudinal Movement for Design Purpose
'S' = Shear Rating of Bearing

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BRIDGE BRANCH

STANDARD SUPERSTRUCTURE DRAWING FOR ROAD BRIDGES

Road Carriageway Width: 7.30m with 2 Footpaths each 1.50m wide	Overall Deck Width: 11.00 m
Effective Simply Supported Span (center to center of Bearings): 10.0 m Reinforced Concrete Deck (no SIDR)	LIVE LOAD: IRC 1 Lane of 70R or 1 or 2 Lanes of Class A, whichever governs, and Footpath Loading

Drg. No.: 6/7 of 4-Webbed RC-Slab-Deck 15.0 m-SS Span

REINFORCEMENT DETAILS OF CROSS GIRDER & MISCELLANEOUS DETAILS

Reviewed by: Prabhakar Niraula (Engineer, DoR)	Forwarded by: Jeevendra Mishra (SDE, DoR)	Date: June, 2021
Recommendation by: Dipak Shrestha (DDG, DoR)	Approved by: Arjun Jung Thapa (DG, DoR)	Revision: 00

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BAR BENDING SCHEDULE OF EXTERIOR MAIN GIRDER (1NO)

S.No:	Bar Mark	Shape of Bar (Not to scale) Dimensions are in mm	Dia. of Bar (mm)	Length of each Bar (mm)	No. of Bars	Total Length of Bars (m)	Weight (kg)
1	EMG1	400 / 15420 / 400	32	16220	8	129.76	819.17
2	EMG2	400 / 14950 / 400	32	15750	4	63.00	397.72
3	EMG3	400 / 11200 / 400	32	12000	2	24.00	151.51
4	EMG4	400 / 7450 / 400	32	8250	2	16.50	104.16
5	EMG5	15420 / 400 / 400	20	16220	4	64.88	159.99
6	EMG6	15420	10	15420	12	185.04	114.17
7	EMG7	200 / 1120 / 2450	12	5480	92	504.16	447.69
8	EMG8	245	32	245	47	11.52	72.69
Total Weight (KG)							2267.12

BAR BENDING SCHEDULE OF INTERIOR MAIN GIRDER (1NO)

S.No:	Bar Mark	Shape of Bar (Not to scale) Dimensions are in mm	Dia. of Bar (mm)	Length of each Bar (mm)	No. of Bars	Total Length of Bars (m)	Weight (kg)
1	IMG 1	400 / 15420 / 400	32	16220	8	129.76	819.17
2	IMG 2	400 / 14950 / 400	32	15750	2	31.50	198.86
3	IMG3	400 / 11200 / 400	32	12000	2	24.00	151.51
4	IMG 4	400 / 7450 / 400	32	8250	2	16.50	104.16
5	IMG 5	400 / 15420 / 400	20	16220	4	64.88	159.99
6	IMG 6	15420	10	15420	12	185.04	114.17
7	IMG 7	200 / 1120 / 2450	12	5480	92	504.16	447.69
8	IMG 8	245	32	245	47	11.52	72.69
Total Weight (KG)							1998.27

BAR BENDING SCHEDULE OF DECK SLAB (1NO)

S.No:	Bar Mark	Shape of Bar (Not to scale) Dimensions are in mm	Dia. of Bar (mm)	Length of each Bar (mm)	No. of Bars	Total Length of Bars (m)	Weight (kg)
1	S1	100 / 8420 / 100	12	8620	156	1344.72	1194.11
2	S2	100 / 8420 / 100	12	8620	156	1344.72	1194.11
3	S3	100 / 15420 / 100	12	15620	58	905.96	804.49
4	S4	100 / 15420 / 100	12	15620	58	905.96	804.49
5	S5	200 / 450 / 450 / 200 / 200	12	1700	237	402.90	357.78
Total Weight (KG)							4354.98

BAR BENDING SCHEDULE OF MID CROSS GIRDER (1NO)

S.No:	Bar Mark	Shape of Bar (Not to scale) Dimensions are in mm	Dia. of Bar (mm)	Length of each Bar (mm)	No. of Bars	Total Length of Bars (m)	Weight (kg)
1	MC1	150 / 6270 / 150	20	6570	6	39.42	97.21
2	MC2	150 / 6270 / 150	20	6570	4	26.28	64.81
3	MC3	165 / 810 / 2450	10	2650	32	65.60	40.48
4	MC4	6270	10	6270	8	50.16	30.95
5	MC5	220	20	220	12	2.64	1.63
Total Weight (KG)							235.07

BAR BENDING SCHEDULE OF END CROSS GIRDER (1NO)

S.No:	Bar Mark	Shape of Bar (Not to scale) Dimensions are in mm	Dia. of Bar (mm)	Length of each Bar (mm)	No. of Bars	Total Length of Bars (m)	Weight (kg)
1	EC1	150 / 6270 / 150	20	6570	6	39.42	97.21
2	EC2	150 / 6270 / 150	20	6570	6	39.42	97.21
3	EC3	165 / 810 / 2450	10	2650	32	65.60	40.48
4	EC4	6270	10	6270	8	50.16	30.95
5	EC5	220	20	220	12	2.64	5.51
6	EC6	200 / 200	10	1600	2	3.20	1.97
Total Weight (KG)							274.33

BAR BENDING SCHEDULE OF PARAPET POST BASE (1 SIDE)

S.No:	Bar Mark	Shape of Bar (Not to scale) Dimensions are in mm	Dia. of Bar (mm)	Length of each Bar (mm)	No. of Bars	Total Length of Bars (m)	Weight (kg)
1	MS1	110 / 500 / 175 / 125 / 325 / 235	10	1470	104	152.88	94.33
2	MS2	15420	10	15420	6	92.52	57.06

BAR BENDING SCHEDULE OF RAILING POST (1 SIDE = 9Nos)

S.No:	Bar Mark	Shape of Bar (Not to scale) Dimensions are in mm	Dia. of Bar (mm)	Length of each Bar (mm)	No. of Bars	Total Length of Bars (m)	Weight (kg)
3	MS3	100 / 1470 / 500	16	2170	36	78.12	123.98
4	MS4	115 / 115 / 2450	8	560	63	35.28	13.94
Total Weight (KG)							289.32

BAR BENDING SCHEDULE OF ROAD KERB (1 SIDE)

S.No:	Bar Mark	Shape of Bar (Not to scale) Dimensions are in mm	Dia. of Bar (mm)	Length of each Bar (mm)	No. of Bars	Total Length of Bars (m)	Weight (kg)
1	MS5	125 / 175 / 125 / 365 / 540 / 310	10	1650	104	171.60	105.88
3	MS6	15420	10	15420	6	92.52	57.08
Total Weight (KG)							162.96

BAR BENDING SCHEDULE OF FOOTPATH PRE CAST SLAB (1NO)

S.No:	Bar Mark	Shape of Bar (Not to scale) Dimensions are in mm	Dia. of Bar (mm)	Length of each Bar (mm)	No. of Bars	Total Length of Bars (m)	Weight (kg)
1	MS7	1210	8	1210	9	10.89	4.30
2	MS8	920	8	920	7	6.44	2.54
3	MS9	1210	10	1210	9	10.89	6.72
4	MS10	920	10	920	7	6.44	3.97
Total Weight (KG)							17.54

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Drg. No.: 7/7 of 4-Webbed RC-Slab-Deck 15.0 m-SS Span

BAR BENDING SCHEDULE

Reviewed by: Pradmani Niraula (Engineer, DoR)	Forwarded by: Jibendra Mishra (SDE, DoR)	Date: June, 2021	
Recommendation by: Dipak Shrestha (CDO, DoR)	Approved by: Arjun Jung Thapa (CO, DoR)	Revisions: 00	

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