

GUIDANCE NOTES FOR DESIGN AND CONSTRUCTION OF PRECAST PRESTRESSED BEAMS IN BRIDGE CONSTRUCTION

GENERAL REQUIREMENTS:

- 1. PRECAST CONCRETE BEAMS ARE PREFERRED FOR ALL BRIDGE CONSTRUCTION WITH APPROPRIATE SPANS EXCEPT AS NOTED BELOW:
 - A. WHERE SKEW ANGLE EXCEEDS 30°
 - B. FOR ELEVATED BRIDGES CURVED ON PLAN.WHERE CONDITIONS A AND B ABOVE EXIST, PRECAST BEAMS MAY BE ADOPTED BUT ONLY SUBJECT TO WRITTEN CONSENT FROM ASHGHAL.
- 2. THE DETAILS SHOWN ON THESE STANDARD DETAILS ARE THE ASHGHAL PREFERRED CHOICE FOR USING PRECAST PRESTRESSED BRIDGE BEAMS IN CONSTRUCTION.
- 3. DRAWING NUMBERS SD 5-1-101 TO SD 5-1-110 SHALL BE REFERRED TO FOR Q-BEAM STRUCTURES.
- 4. DRAWING NUMBERS SD 5-1-111 TO SD 5-1-115 SHALL BE REFERRED TO FOR TY TYPE STRUCTURES.
- 5. THE DETAILS SHOWN ON THESE STANDARD ARE TO BE FULLY DESIGNED BY THE DESIGNER WHO SHALL TAKE COMPLETE LIABILITY FOR THE DESIGN.
- 6. THE STANDARD DETAILS ARE GENERIC IN NATURE AND MUST BE FURTHER DEVELOPED BY THE DESIGNER AS NECESSARY TO SUIT THE PARTICULAR APPLICATION.
- 7. WHERE THESE STANDARD DETAILS ARE ADOPTED AS THE BASIS OF A DETAIL INCLUDED IN A DESIGN, THE DESIGNER SHALL BE ENTIRELY RESPONSIBLE FOR THE COMPLETED DETAIL AND ALL ASSOCIATED LIABILITY. DESIGNERS MUST THEREFORE SATISFY THEMSELVES AS TO THE SUITABILITY OF THE STANDARD DETAIL FOR THE PROPOSED APPLICATION.
- 8. DESIGNERS SHALL ADOPT THE STANDARD DETAILS SHOWN AS THE BASIS OF THEIR COMPLETED DESIGN UNLESS THEY CONSIDER THAT A DETAIL IS UNSUITABLE AND OBTAIN WRITTEN AGREEMENT FROM ASHGHAL THAT IT SHALL NOT BE USED.
- 9. PRECAST BEAMS ARE TO BE DESIGNED IN ACCORDANCE ALL ASHGHAL DESIGN CRITERIA, CIRCULARS, INTERIM ADVICE NOTES ETC. THE REQUIREMENTS OF THESE DRAWINGS SHALL GOVERN IF THERE IS CONFLICT OF DESIGN AND SPECIFICATION REQUIREMENTS.

PRECAST BEAM DESIGN REQUIREMENTS:

- 1. THE SPAN RANGE PROVIDED FOR EACH SECTION IS AN INDICATIVE SPAN RANGE AND IS BASED ON SIMPLY SUPPORTED CONDITIONS AND FOR BRIDGE DECKS WHICH ARE OVERLAID WITH ONLY HIGHWAY SURFACING (ie. NOT OVERLAID WITH FILL SUCH AS TUNNEL CONSTRUCTION). DESIGNERS SHALL OPTIMIZE THE BEAMS WHEREVER POSSIBLE WHEN CONTINUITY OF LOAD EFFECTS IS INCORPORATED INTO THE DESIGN.
- 2. THE RANGE OF BEAM SPACING FOR THE Q-BEAM SECTIONS ARE AS SHOWN ON THE DRAWINGS. THIS IS THE ASHGHAL PREFERRED RANGE FOR PRACTICAL AND AESTHETIC REASONS.
- 3. STRANDS SHOWN ARE THE PERMITTED STRAND POSITIONS FOR EACH SECTION. DESIGNER SHALL SELECT THE REQUIRED NUMBER OF STRANDS IN ORDER TO PROVIDE A BALANCED DESIGN WITHIN THE PERMISSIBLE STRESSES OF THE GOVERNING DESIGN CODE. ADDITIONAL OR ALTERNATIVE STRAND POSITIONS MAY BE ADOPTED SUBJECT TO THE WRITTEN CONSENT OF ASHGHAL.
- 4. STRANDS SHALL BE PROVIDED STRAIGHT WITH DEBONDING PROVIDED AS APPROPRIATE TO CONTROL STRESSES.
- 5. Q-BEAMS ARE TO BE ADOPTED FOR SKEWS OF LESS THAN OR EQUAL TO 30 DEGREES. SKEWS GREATER THAN 30 DEGREES REQUIRES ADVANCE AGREEMENT WITH ASHGHAL. INTERMEDIATE(INTERNAL) DIAPHRAGMS, SHEAR LINKS AND TOP FLANGE REINFORCEMENT ARE TO BE PLACED NORMAL TO BE THE BEAM FOR SKEW ARRANGEMENTS. SKEW ENDS ARE TO BE PROVIDED BY THE END DIAPHRAGMS INCORPORATING A FANNED ARRANGEMENT OF REINFORCEMENT.
- 6. TY TYPE BEAMS ARE TO BE ADOPTED FOR SKEWS UP TO 30 DEGREES. SKEWS GREATER THAN 30 DEGREES REQUIRES ADVANCE AGREEMENT WITH ASHGHAL.
- 7. BRIDGES CONSTRUCTED FROM PRECAST BEAMS APPRECIABLY CURVED IN PLAN ARE GENERALLY UNATTRACTIVE AND ARE NOT PREFERRED. CURVED BRIDGES MAY ONLY BE CONSIDERED SUBJECT TO ADVANCE AGREEMENT WITH ASHGHAL.
- 8. THE OPEN FLANGE Q-BEAM IS THE PREFERRED FORM OF CONSTRUCTION AND IS DETAILED. IF CONSIDERED NECESSARY, CLOSED FLANGE Q-BEAM MAY BE USED BUT SUBJECT TO WRITTEN CONSENT FROM ASHGHAL.
- 9. IF APPLICABLE, DESIGNS SHALL CONSIDER THE FIRE SAFETY REQUIREMENTS OF ALL RELEVANT ASHGHAL DESIGN CRITERIA, CIRCULARS, INTERIM ADVICE NOTES ETC.

DETAILING REQUIREMENTS:

- 1. THE STANDARDIZED DETAILS ARE PROVIDED AS A SET OF GUIDELINES FOR DESIGNERS AND CONTRACTORS. DESIGNERS SHALL PREPARE DRAWINGS SPECIFIC TO EACH DESIGN INDICATING THE STRAND AND REINFORCEMENT REQUIREMENTS OF THEIR DESIGN. ACTUAL DESIGN REQUIREMENTS.
- THE PROVISIONS FOR LIFTING OF PRECAST BEAMS HAVE NOT BEEN STANDARDIZED. LIFTING ASSUMPTIONS MADE IN THE DESIGN SHALL BE CLEARLY SHOWN ON THE DESIGNERS DRAWINGS TO INDICATE ANY RESTRICTIONS TO THE BEAM MANUFACTURER.

CONTINUITY AT INTERMEDIATE SUPPORTS:

Q-BEAMS:

- 1. THE PREFERRED CONNECTION DETAILS FOR CONTINUITY BETWEEN SPANS ARE AS SHOWN ON THE DRAWINGS.
- 2. THE CONNECTION OF BEAMS BETWEEN SPANS SHALL ONLY BE CONSIDERED AS FULLY EFFECTIVE. A FULLY EFFECTIVE JOINT AT A CONTINUITY DIAPHRAGM IS A JOINT CAPABLE OF FULL MOMENT TRANSFER BETWEEN SPANS, RESULTING IN THE STRUCTURE BEHAVING AS A CONTINUOUS STRUCTURE FOR LOADING APPLIED ON THE STRUCTURE AFTER CONTINUITY IS ESTABLISHED.
- 3. THE DESIGNER SHALL PAY PARTICULAR ATTENTION TO THE EFFECTS OF TIME-DEPENDENT ACTIONS SUCH AS CREEP AND SHRINKAGE TO ENSURE THE FOLLOWING:
 - A. THE INTERFACES BETWEEN PRECAST BEAM AND IN-SITU DIAPHRAGMS AT BOTTOM FLANGE LEVEL DO NOT OPEN OR CRACK IN EXCESS OF THE LIMITING WIDTHS.
 - B. THE JOINT REMAINS FULLY EFFECTIVE, ENSURING THAT STRUCTURAL CONTINUITY IS MAINTAINED ACROSS THE JOINT FOR THE DESIGN LIFE OF THE BRIDGE.
- 4. A FULLY EFFECTIVE CONNECTION MAY ALSO BE PROVIDED BY COMPLIANCE WITH THE 90-DAY RULE IN AASHTO -LFRD (2010) IN CLAUSE 5.14.1.4.4 - AGE OF GIRDER WHEN CONTINUITY IS ESTABLISHED. THIS OPTION IS ONLY PERMITTED IF NO ADVERSE EFFECT IS CREATED ON THE CONSTRUCTION PROGRAMME, UNLESS OTHERWISE AGREED WITH ASHGHAL.
- 5. CONTINUITY SHALL BE PROVIDED BY PROJECTING REINFORCING BARS AND OR STRANDS FROM THE ENDS OF THE BEAM INTO THE IN SITU DIAPHRAGM. DEBONDED STRANDS SHALL NOT BE PROJECTED INTO THE DIAPHRAGMS AND SHALL BE CUT FLUSH WITH THE END FACE OF THE BEAM. TO PREVENT THE DEBONDED STRANDS FROM COMPRESSIVE FORCES, POLYSTYRENE BLOCKS A MINIMUM OF 25mm THICK SHALL BE PLACED OVER THE DEBONDED STRANDS WHICH ARE CUT FLUSH AT THE ENDS OF THE BEAMS.
- 6. THE CONTINUITY BARS SHALL BE ARRANGED SO THAT BEAMS CAN BE EASILY LIFTED INTO PLACE.

TY AND TYE BEAMS:

- 1. THE PREFERRED CONNECTION DETAILS FOR CONTINUITY BETWEEN SPANS ARE AS SHOWN ON THE DRAWINGS. HE CONNECTION OF BEAMS BETWEEN SPANS SHALL ONLY BE CONSIDERED AS FULLY EFFECTIVE. A FULLY EFFECTIVE JOINT AT A CONTINUITY DIAPHRAGM IS A JOINT CAPABLE OF FULL MOMENT TRANSFER BETWEEN SPANS, RESULTING IN THE STRUCTURE BEHAVING AS A CONTINUOUS STRUCTURE FOR LOADING APPLIED ON THE STRUCTURE AFTER CONTINUITY IS ESTABLISHED.
- 3. THE DESIGNER SHALL PAY PARTICULAR ATTENTION TO THE EFFECTS OF TIME-DEPENDENT ACTIONS SUCH AS CREEP AND SHRINKAGE TO ENSURE THE FOLLOWING:
 - A. THE INTERFACES BETWEEN PRECAST BEAM AND IN-SITU DIAPHRAGMS AT BOTTOM FLANGE LEVEL DO NOT OPEN OR CRACK IN EXCESS OF THE LIMITING WIDTHS.
 - B. THE JOINT REMAINS FULLY EFFECTIVE, ENSURING THAT STRUCTURAL CONTINUITY IS MAINTAINED ACROSS THE JOINT FOR THE DESIGN LIFE OF THE BRIDGE.
- 4. A FULLY EFFECTIVE CONNECTION MAY ALSO BE PROVIDED BY COMPLIANCE WITH THE 90-DAY RULE IN AASHTO -LFRD (2010) IN CLAUSE 5.14.1.4.4 - AGE OF GIRDER WHEN CONTINUITY IS ESTABLISHED. THIS OPTION IS ONLY PERMITTED IF NO ADVERSE EFFECT IS CREATED ON THE CONSTRUCTION PROGRAMME, UNLESS OTHERWISE AGREED WITH ASHGHAL.
- 5. CONTINUITY SHALL BE PROVIDED BY PROJECTING REINFORCING BARS AND OR STRANDS FROM THE ENDS OF THE BEAM INTO THE IN SITU DIAPHRAGM. DEBONDED STRANDS SHALL NOT BE PROJECTED INTO THE DIAPHRAGMS AND SHALL BE CUT FLUSH WITH THE END FACE OF THE BEAM. TO PREVENT THE DEBONDED STRANDS FROM COMPRESSIVE FORCES, POLYSTYRENE BLOCKS A MINIMUM OF 25mm THICK SHALL BE PLACED OVER THE DEBONDED STRANDS WHICH ARE CUT FLUSH AT THE ENDS OF THE BEAMS.
- 6. THE CONTINUITY BARS SHALL BE ARRANGED SO THAT BEAMS CAN BE EASILY LIFTED INTO PLACE.

CONNECTION DETAILS AT ABUTMENTS

- 1. THE PREFERRED CONNECTION DETAILS AT ABUTMENTS ARE AS SHOWN ON THE DRAWINGS.
- 2. THE CONTINUITY BARS AT INTEGRAL ABUTMENTS SHALL BE ARRANGED SO THAT BEAMS CAN BE EASILY LIFTED INTO PLACE.

NOTES:

2	23/10/2013	REVISED LOGO AND DWG NUMBER	I. FLYNN
1	23/09/2013	DESIGN REQUIREMENTS Note 5 Edited	I. FLYNN
Rev.	Date	Revision Details	Appd.
هيئة الأشغال العامة Public Works Authority			
P.O.Box 22188 Tel. : (0874) 44950000 Fax. : (0874) 44950999 www.ashghal.gov.qa			
قطر تستحق الأفضل Qatar Deserves The Best			
PA PROJECTS AFFAIRS			
QCS Section: 5 (CONCRETE) PART 1 (GENERAL)			
Drawing Title: PRECAST BEAMS GENERAL NOTES			
Approved: I.FLYNN		Sheet No: 1 OF 1	
Date: OCTOBER 2013		Scale: NTS	
Drawing Number: SD 5-1-100			Revision: 2