

CATEGORY

BUILDING SYSTEMS



PRODUCT / TECHNOLOGY



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Technology Detail

**HEADED BARS AS MECHANICAL ANCHORAGE SYSTEM FOR
REINFORCED CONCRETE BEAM-COLUMN JOINTS**

Alternate System for Steel development length.



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Video

CONTACT DETAILS

CSIR- Central Building Research Institute, Roorkee

Contact Person: Shri Ajay Chourasia

Address: SE Division, Roorkee- 247667

Email: ajaycbri@gmail.com

Mob: 9897209050



BRIEF

Headed bars consists of steel anchor (head) attached to the end of beam rebar through welding or threading and embedded in concrete. Unlike the plain head anchors, herein the deformed head anchors are used, which consists of deformations (grooves and ribs) over the anchor surface for better interlocking and gripping with the surrounding concrete. These ribs are circular projections protruded outwards with a protrusion of 2 mm from the head surface. Plain headed anchors have the tendency of slipping and movement in the concrete, whereas deformed headed bars are expected to experience low slippage. These headed bars are placed parallelly in the reinforced concrete (RC) beam-column joint region such that they are not in contact of each other.

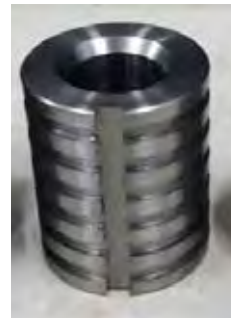
The advantages of headed bar over development length relate to reduction in steel congestion, saving in construction costs, better concrete consolidation, adequate anchorage, better bond strength and speed in construction.



Head anchor for 32
mm dia rebar



Head anchor for 25
mm dia rebar



Head anchor for 20
mm dia rebar



Head anchor for 16
mm dia rebar



SALIENT FEATURES

- Easy workmanship and concreting
- Cost-effective as compared to conventional development length
- Rapid construction
- Efficient mechanical anchorage system, leading to excellent strength of beam-column joints

ECONOMIC ASPECTS

The technology will ensure cost reduction over conventional construction based on diameter of beam rebar as illustrated in Table 1.

Table 1. Cost Analysis of Headed Bars

Rebar Dia (mm)	Anchor Dia (mm)	Anchor Length (mm)	Anchor Cost* (₹)	Total Costing of Anchor# (₹)	Costing of Development Length% (₹)
12	24	27	20.50	36.50	38.40
16	32	36	32.50	64.36	91.02
20	40	45	53.00	104.11	177.78
25	50	56	90.50	172.91	347.22
32	64	72	174.50	315.58	728.18

*Cost as per manufacturer

#Anchor cost + rebar cost, considering rate of ₹60/kg including labour charges. (Rebar length embedded in beam considered as 300 mm)

%Development length as per IS-13920:2016, considering rate of ₹60/kg including labour charges



SUSTAINABILITY ASPECTS

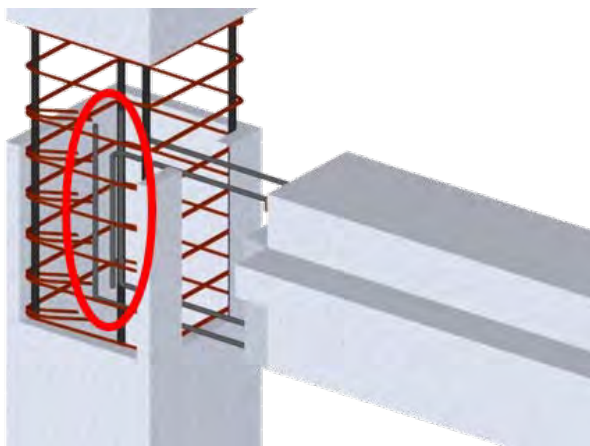
- Headed bars require less steel as compared to conventional system of mechanical anchorage in RC beam-column joints, thus bestowing a more sustainable system.

SUITABILITY & AVAILABILITY

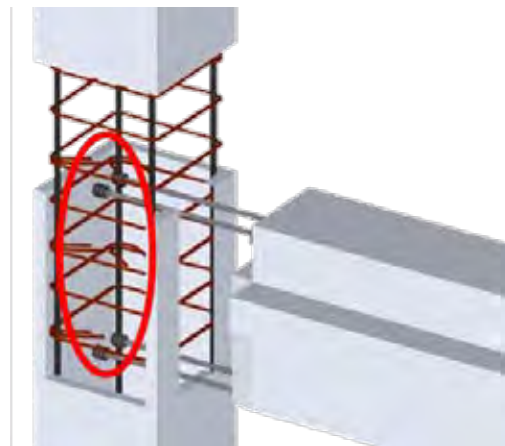
- Suitable for all climatic conditions
- Suitable for individual /scattered and low to medium height (G+3) houses, as well as high-rise buildings.
- Can be manufactured using lath machine by any steel fabricator.

LIMITATIONS, IF ANY

- Suitable for RC beam-column joints with rebar diameter ≥ 12 mm.
- Grooves and ribs may be provided on head surface for better bond.
- Best performance when ratio of head length and diameter is 1.
- Condition: Head diameter ≥ 2.25 (rebar diameter); and head area ≥ 5 (rebar area).



Conventional Development Length



Headed Bars



Plain Headed Bars



Grooved Headed Bars



Ribbed Headed Bars



MARKET LINKAGES

- The technology/ know-how is available at CBRI-Roorkee.

MAJOR PROJECTS

- Currently being implemented in building construction at National Institute of Technology Goa.

CERTIFICATION/INDIAN STANDARD/ ENDORSEMENT

- In the process to be included in the revised version of IS 13920.



Headed Bar Embedded in Concrete Cube



Pull-out Test Set-up



Experimental Set-up



Cyclic Load Test Set-up