	<p style="text-align: center;">NEPAL BUREAU OF STANDARDS AND METROLOGY</p> <p style="text-align: center;">NEPAL PRODUCT CERTIFICATION SCHEME</p>	<p style="text-align: center;">STI</p>
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SCHEME OF TESTING AND INSPECTION FOR CERTIFICATION OF DEFORMED  
STEEL BARS AND WIRES  
FOR CONCRETE REINFORCEMENT ACCORDING TO NS 191

**1 LABORATORY –**

A laboratory shall be maintained which shall be suitably equipped and staffed where different tests given in the specification shall be carried out in accordance with the methods given in the specification.

**2 TEST RECORDS\_-**

All records of tests, inspection and calibration shall be kept in suitable forms as mentioned in quality manual

2.1 All testing apparatus/measuring instruments shall be periodically checked and calibrated and records of such checks/calibration shall be maintained.

2.2 Copies of any records and other connected papers that may be required by the Bureau shall be made available at any time on request.


**3 QUALITY CONTROL\_-**

It is recommended that, as far as possible, Statistical Quality Control (SQC) methods may be used for controlling the quality of the product during production as envisaged in this Scheme

**4 STANDARD\_MARK\_-**

The Standard Mark, is mandatory as per Nepal Standards (Certification) Mark act on deformed steel bars and wires for concrete reinforcement.

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## **5 TEST CERTIFICATE -**

For each consignment conforming to NS:191 there shall be a test certificate which shall contain the Standard Mark, the cast/lot number, grade, size and corresponding test results (as given in Annexure I).

## **6 IDENTIFICATION AND MARKING**


The manufacturer or supplier shall have ingots, billets and bars or bundles of bars/wires marked in such a way that all finished bars/wires can be traced to the cast from which they were made. Every facility shall be given to the purchaser or his authorized representative for tracing the bars/wires to the cast from which they were made.

- 6.1 For each bundle/coil of bars/wires a tag shall be attached indicating cast/lot number, grade and size.
- 6.2 Identification marks like brand name, trade-mark etc, that are introduced during rolling shall be designed and located in such a manner that the performance in use of the bar is not affected.

## **7 LEVELS OF CONTROL:**

Inspection and tests at various levels of control specified in Table 1 shall be carried out on all quantities of steel covered by this Scheme and appropriate records and charts maintained in accordance with para 2 above. All the production which conforms to the Nepal Standards and covered by the licence shall be marked with certification mark of the Bureau.

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7.1 **RAW MATERIAL:** Deformed steel bars and wires shall have the chemical composition in accordance with the requirements specified in clause 3.2 of the specification (NS 191).


7.2 All twisting shall be carried out when cold stretching may or may not be combined with twisting. The untwisted length at each end of the bar shall not exceed 100 mm or 4 times the nominal diameter, whichever is greater.

7.3 On the basis of tests and inspection results, decision regarding conformity or otherwise of lots of steel to the requirements of the specification shall be taken as indicated below:

7.3.1 **CHEMICAL COMPOSITION :** Chemical Composition of the different categories of steel obtained by analyzing three samples from each heat of 100 tonnes and above and two samples for each heat of less than 100 tones ,shall conform to the requirements laid down in the specification.

Supplier test certificate of billet shall be the basis of verifying compliance to chemical composition of deformed steel bar or wires as per 3.2 of the specification.

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7.3.2 **FREEDOM FROM DEFECTS:** All finished steel shall be rolled to the dimensions and mass specified. The finished material shall be free from harmful surface flaws, laminations, rough and imperfect edges and all other defects. The defective material shall be sorted out and shall not be covered under the scheme unless the defects are satisfactorily removed by recognized methods. The material thus rectified shall be re-examined and covered under the scheme if found satisfactory.

7.3.3 **TENSILE TEST:** Periodic calibration should be done of the tensile testing machines. The frequency of such calibration should be at least once in a year.

7.3.3.1 The frequency of tensile, Bend & Re-Bend tests shall be as given below if the material is rolled from one cast. A separate test shall be made from each type of finished bars and for each variation in size.


Nominal Size Quantity	
For casts/heats below	For casts/heats over
100 tonnes	100 tonnes
For All Sizes 2 Per Cast	3 Per Cast

7.4 All bars/wires should be identifiable by marks/brands introduced during rolling which indicate the name of the manufacturer or their brand name.

7.5 The location on the finished product from where the test samples are to be taken and the procedure for the preparation of the test pieces from test samples shall be in accordance with clause 8.1 of the specification.

7.6 **RE-TEST** - If any one of the test pieces first selected fails to conform to any of the tests as given in the specification, two further samples shall be selected for testing

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in respect of each failure. Should the test pieces from both these additional samples pass, the material represented by the test samples shall be deemed as fit to be covered under NS Certification Marks Scheme.

**7.7 DEFORMATIONS AND SURFACE CHARACTERISTICS** - For highstrength deformed bars/wires, the mean area of ribs (in  $\text{mm}^2$ ) per unit length (in mm) above the core of the bar/wire, projected on a plane normal to the axis of the bar/wire calculated in accordance with 5.4 of the specification shall not be less than the following values:

0.12  $\bar{O}$  for  $\bar{O} < 10$  mm

0.15  $\bar{O}$  for  $10 \text{ mm} < \bar{O} < 16\text{mm}$

0.17  $\bar{O}$  for  $\bar{O} > 16$  mm

Where  $\bar{O}$  is the nominal diameter of bar/wire in mm.


The mean projected area of transverse ribs alone shall be not less than one- third of the values given above.

The calculations for mean projected area  $A_r$  may be done as per Cl.4.4, 4.5 and 4.6 of the specification. Frequency of such calculation shall be once in a day for each size rolled.

**7.8** When subjected to pull-out test in accordance with NS 413 of the specification the bond strength calculated from the load at a measured slip of 0.025 mm and 0.25 mm for deformed bars/wires shall exceed that of a plain round bar of the same nominal size by 40 per cent and 80 per cent respectively. The bond test in such cases shall be done in accordance with NS 413 Pull out rest shall be done in addition to 5.2 for approval of new or amended geometry for the first time.

**7.9** The licensee shall also verify the deformation pattern of the high strength deformed

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steel bars and wires on the production line preferably at an interval of one hour at each twisting machine against the registered design. Proper records shall be maintained for this.

## **8 REJECTIONS –**

A separate record shall be maintained giving information relating to the rejection of the production not conforming to the requirements of the specification and the method of its disposal. Such material shall in no circumstances be stored together with that conforming to the specification.


## **9 SAMPLES\_–**

The licensee shall supply, free of charge, the samples required in accordance with the Bureau of Nepal Standards (Certification) Regulations, as subsequently amended, from the factory or godowns. The Bureau shall pay for the samples taken by it from the open market.

## **10 REPLACEMENT\_–**

Whenever a complaint is received soon after the goods with Standard Marks have been purchased and used, and if there is adequate evidence that the goods have not been misused, defective goods or their components are replaced or repaired free of cost by the licensee in case the complaint is proved to be genuine and the warranty period (where applicable) has not expired. The final authority to judge the conformity of the product to the Nepal Standard shall be with the Bureau.

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11 In the event of any damages caused by the goods bearing the Standard Mark, or claim being filed by the consumers against NS Standard Mark and not conforming to the relevant Nepal Standard, entire liability arising out of such non conforming product shall be of licensee and NBSM shall not in any way be responsible in such cases.


## 12 STOP MARKING –

The marking of the product shall be stopped under intimation to the NBSM if, at any time, there is some difficulty in maintaining the conformity of their product to the specification, or the testing equipment goes out of order. The marking may be resumed as soon as the defects are removed under intimation to Bureau.

12.1 The marking of the product shall be stopped immediately if directed to do so by Bureau for any reason. The marking may then be resumed only after permission by the Bureau. The information regarding resumption of markings shall also be sent to the Bureau.

Table 1

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**TABLE 1 LEVELS OF CONTROL**  
(Clause 5 of the Scheme of Testing & Inspection)


TEST DETAILS				LEVELS OF CONTROL			Remarks
Sr. No.	Requirements	Test Method		No. of Samples	Lot Size	Frequency	
		Clause	Reference				
1	Chemical Composition		NS 191	3	One heat	Each heat of 100 tonnes capacity or more.	3 samples should be drawn from the beginning, middle and end of teeming. For heats less than 100 tonnes capacity, one from the beginning and the other from the end of the teeming.
	Ladle Analysis						
				2	One heat	Each heat of less than 100 tonnes	

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TEST DETAILS			LEVELS OF CONTROL			Remarks
Sr. No.	Requirements	Test Method		No. of Samples	Lot Size	
		Clause	Reference			
	Check Analysis	One sample for every 100 tonnes or part thereof of material rolled out of billets from the same cast. Alternatively, an equivalent quality control, set up by the factory itself, which will ensure conformity of the products to the limits of variations permissible in the specification, is also acceptable, the alternate quality control scheme is subject to approval by NBSM.				
	Freedom from defects.		NS 191			Adequate inspection to ensure each item to be free

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TEST DETAILS				LEVELS OF CONTROL			Remarks
Sr. No.	Requirements	Test Method		No. of Samples	Lot Size	Frequency	
		Clause	Reference				
	Tensile test.		NS 203	3 2	For cast above 100 tonnes  For cast below 100 tonnes	Each lot.	(Ref. 5.3.3.1 of STI)
	Bend Test		NS 333	-do-		-do-	
	Rebend Test		NS 191	-do-		-do-	

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TEST DETAILS				LEVELS OF CONTROL			Remarks
Sr. No.	Requirements	Test Method		No. of Samples	Lot Size	Frequency	
		Clause	Reference				
	Deformation & Surface characteristics		NS 191	Every day`s production			Each size rolled.
7.	Nominal Size, Mass and Tolerances.		NS 191				Adequate inspection to ensure each item to be within the limits of the specification.

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<p>ANNEXURE I</p> <p>(Clause 4.1 of the Scheme of Testing &amp; Inspection)</p> <p><u>XYZ IRON AND STEEL COMPANY</u></p>	<p>Standard Mark</p>
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TEST CERTIFICATE FOR DEFORMED STEEL BARS AND WIRES FOR CONCRETE REINFORCEMENT TEST  
 CERTIFICATE NO. \_\_\_\_\_ DATE: \_\_\_\_\_

M/s \_\_\_\_\_

We certify that the material described below fully conforms to NS 191. Chemical composition and mechanical properties of the product as tested in accordance with the Scheme of Testing and Inspection contained in the NS Certification Marks License No.CM/L are as indicated against each other.

(PLEASE REFER TO NS 191 FOR DETAILS OF SPECIFICATION REQUIREMENTS) TEST RESULTS

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Order No.	Nominal Size	Cast/Heat No.	Quantity MT	Date of Testing	CHEMICAL ANALYSIS				CE	MECHANICAL PROPERTIES							Grade of	Remarks
					C %	S %	P %	S&P %		0.2% Proof Stress N/mm <sup>2</sup>	0.2% Proof Stress N/mm <sup>2</sup>	Tensile strength N/mm <sup>2</sup>	TS/YS ratio	Elongation %	Total Elongation %	Bend Test		

The material supplied conforms to the standard rolling and mass tolerances.

#### REMARKS

(It is suggested that size and paper (210x297) mm be used

for this Test Certificates) CHIEF METALURGIST

For XYZ IRON AND STEEL COMPANY