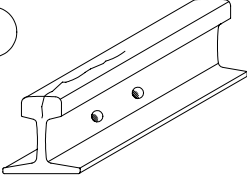
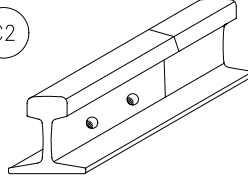
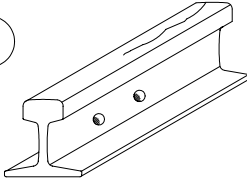
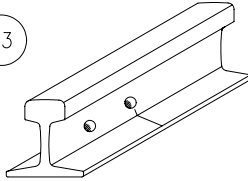
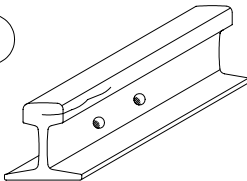
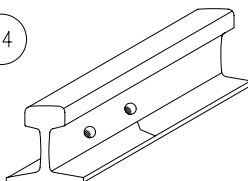
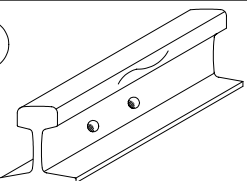
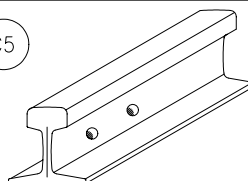
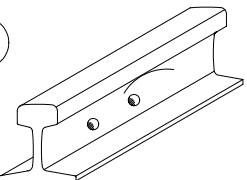
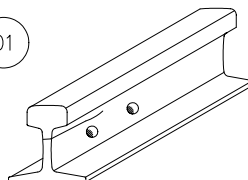
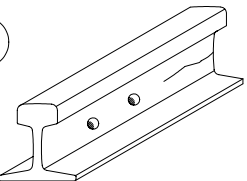
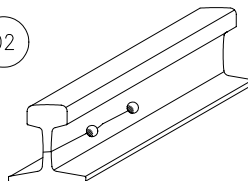
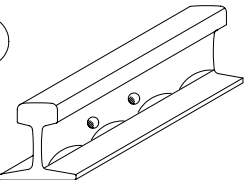
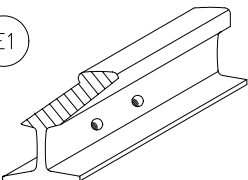
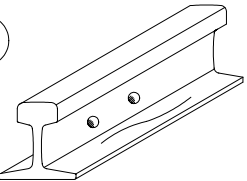
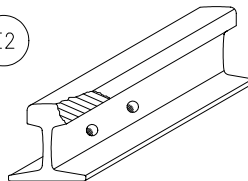
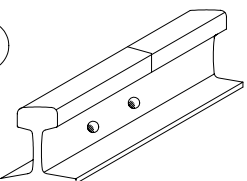
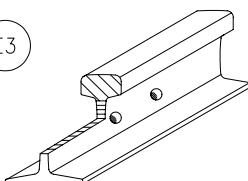
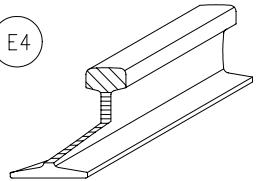
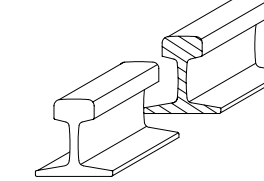
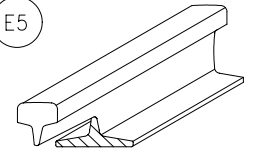
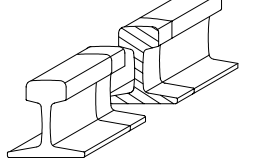
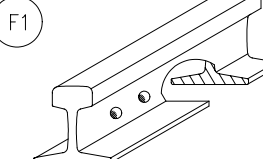
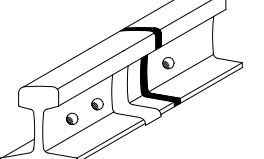
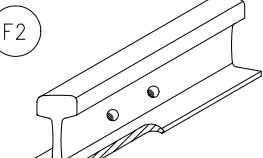
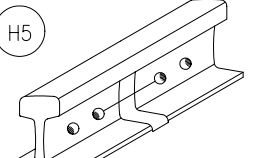
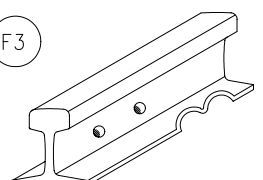
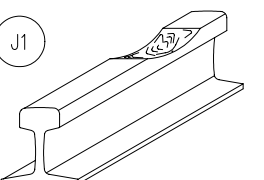
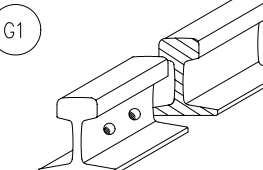
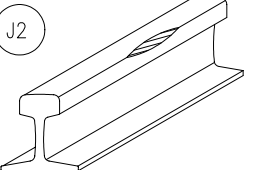
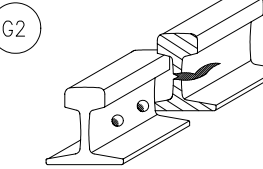
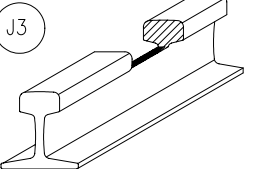
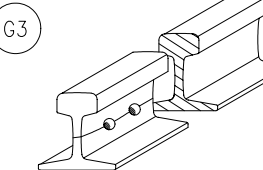
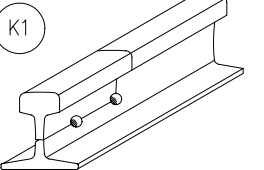
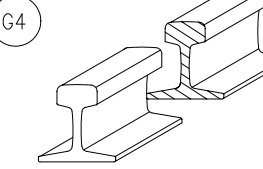
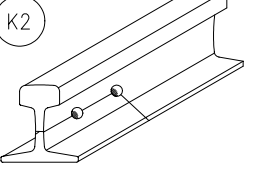
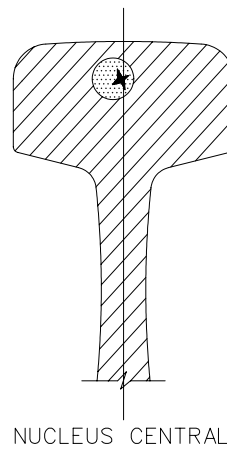
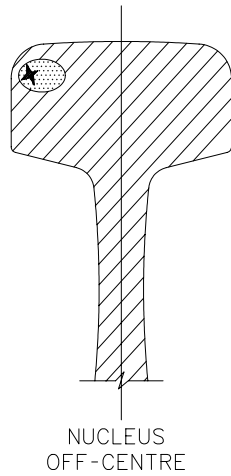


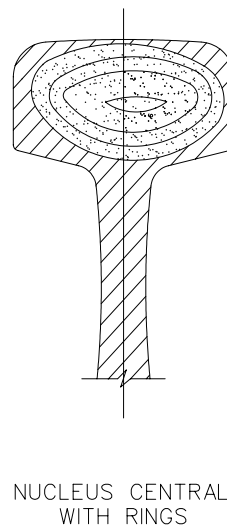
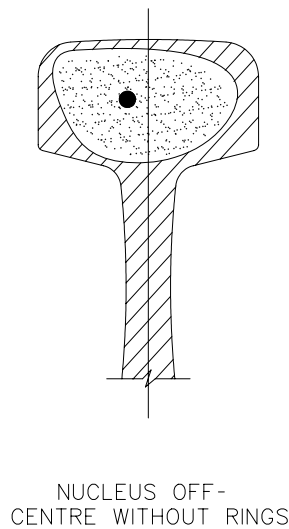
<p>A1</p>  <p>VERTICAL CRACK THROUGH CROWN AT END.</p>	<p>C2</p>  <p>TRANSVERSE CRACK ACROSS HEAD ORIGINATING FROM TRACK BOND.</p>
<p>A2</p>  <p>CRACK THROUGH CROWN OF RAIL IN RUNNING SURFACE.</p>	<p>C3</p>  <p>TRANSVERSE CRACK ACROSS FLANGE ORIGINATING FROM TRACK BOND.</p>
<p>A3</p>  <p>HORIZONTAL CRACK IN HEAD OF RAIL AT END.</p>	<p>C4</p>  <p>TRANSVERSE CRACK ACROSS FLANGE.</p>
<p>A4</p>  <p>HORIZONTAL CRACK IN SIDE OF HEAD OF RAIL.</p>	<p>C5</p>  <p>VERTICAL CRACK IN SECTION OF RAIL AT END.</p>
<p>B1</p>  <p>CRACK ALONG RAIL AT JUNCTION OF HEAD AND WEB.</p>	<p>D1</p>  <p>CRACK IN WEB OF RAIL AT END.</p>
<p>B2</p>  <p>HORIZONTAL CRACK IN BODY OF WEB.</p>	<p>D2</p>  <p>CRACK IN WEB ALONG FISH-BOLT HOLES.</p>
<p>B3</p>  <p>CRACKS AT JUNCTION OF WEB AND FLANGE (OVER SLEEPERS).</p>	<p>E1</p>  <p>PIECE OF CROWN BROKEN AWAY AT END.</p>
<p>B4</p>  <p>CRACK ALONG FLANGE OF RAIL.</p>	<p>E2</p>  <p>PIECE BROKEN AWAY FROM SIDE OF HEAD AT END.</p>
<p>C1</p>  <p>TRANSVERSE CRACK ACROSS HEAD.</p>	<p>E3</p>  <p>HEAD OF RAIL BROKEN AWAY AT END.</p>

	<p>(E4) PORTION OF HEAD AND WEB OF RAIL BROKEN AWAY AT END.</p>		<p>(H1) BREAK THROUGH FLASH-BUTT WELD. (H4) BREAK THROUGH ARC-BUTT WELD.</p>
	<p>(E5) PORTION OF WEB AND FLANGE OF RAIL BROKEN AWAY AT END.</p>		<p>(H2) BREAK THROUGH THERMIT WELD. (H6) BREAK THROUGH THERMIT WELD AT JUNCTION RAIL.</p>
	<p>(F1) PORTION OF WEB AND FLANGE OF RAIL BROKEN OUT.</p>		<p>(H3) BREAK THROUGH RAIL ADJACENT TO THERMIT WELD. (H7) BREAK THROUGH RAIL ADJACENT TO THERMIT WELD AT JUNCTION RAIL.</p>
	<p>(F2) PORTION OF FLANGE BROKEN AWAY AT END.</p>		<p>(H5) CRACK ACROSS THERMIT WELD.</p>
	<p>(F3) PIECE OF FLANGE BROKEN OUT.</p>		<p>(J1) RAIL DAMAGED BY SPINNING WHEELS.</p>
	<p>(G1) BREAK THROUGH SECTION OF RAIL.</p>		<p>(J2) PIECE BROKEN OUT FROM SIDE OF HEAD.</p>
	<p>(G2) BREAK THROUGH SECTION OF RAIL AND LONGITUDINAL CRACK IN WEB.</p>		<p>(J3) PORTION BROKEN OUT OF HEAD OF RAIL.</p>
	<p>(G3) BREAK THROUGH HEAD AND FLANGE OF RAIL WITH CRACKS EXTENDING INTO THE FISH-BOLT HOLES.</p>		<p>(K1) PIECE OF HEAD AND WEB BROKEN AWAY THROUGH FISH-BOLT HOLES.</p>
	<p>(G4) BREAK THROUGH SECTION OF RAIL, ANNEXURE 17 SHEET 3.</p>		<p>(K2) PIECE OF WEB AND FLANGE BROKEN AWAY THROUGH FISH-BOLT HOLES.</p>

EARLY STAGE



LATE STAGE

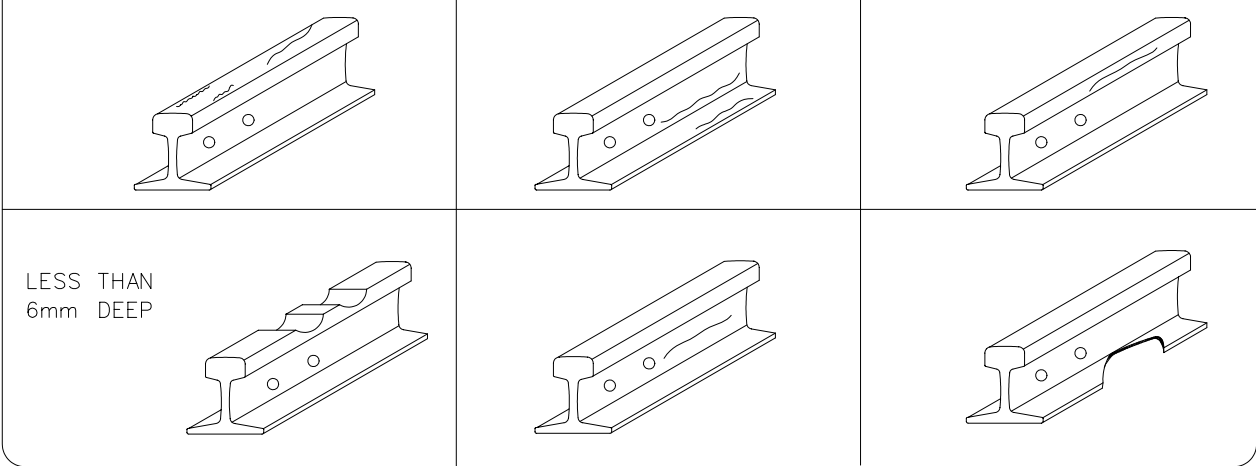


REMARKS:

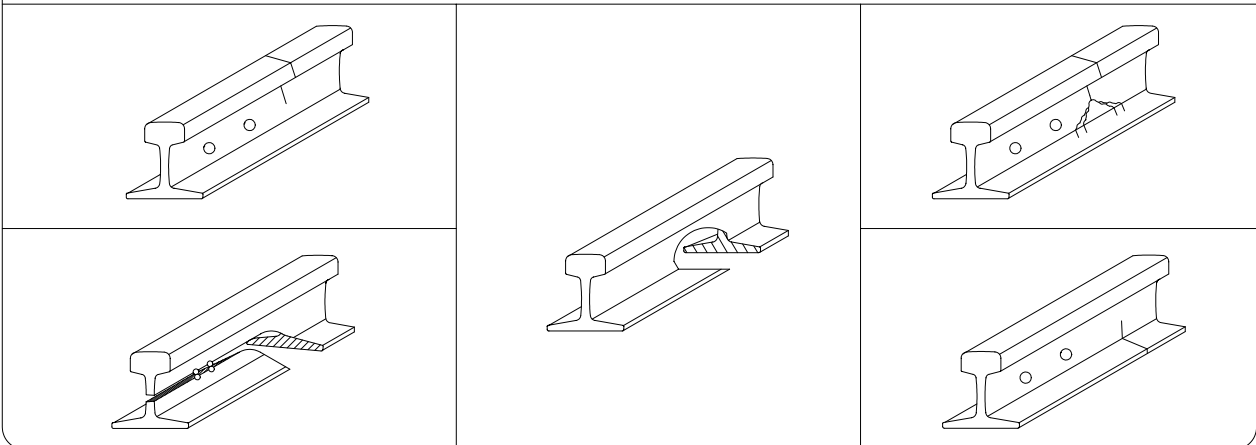
1. THE TRANSVERSE FISSURE FLAW IS A PROGRESSIVE CROSSWISE FRACTURE STARTING FROM A NUCLEUS INSIDE THE HEAD OF THE RAIL AND SPREADING OUTWARDS UNTIL FRACTURE OF THE RAIL RESULTS. THE FLAW SPREADS MORE QUICKLY AS IT BECOMES LARGER.
2. THE SKETCHES ABOVE INDICATE VARIOUS STAGES OF THE DEVELOPMENT OF TRANSVERSE FISSURES.
3. THIS TYPE OF FLAW IS DANGEROUS AS THE RAIL USUALLY DEVELOPS A NUMBER OF FLAWS AND BREAKS INTO A NUMBER OF PIECES.
4. ULTRASONIC TESTING PROVIDES THE MOST SUCCESSFUL METHOD OF ESTABLISHING THE PRESENCE OF SUCH FISSURES.
5. WHEN CRACKS ACROSS THE HEAD OF A RAIL ARE DISCOVERED, THE RAIL, AFTER REMOVAL FROM THE TRACK, MUST BE BROKEN TO ESTABLISH WHETHER A TRANSVERSE FISSURE FLAW IS THE CAUSE, AND TO WHAT EXTENT IT CORRELATES WITH ULTRASONIC TESTS.

RAIL DEFECTS AND FRACTURES :  
SAFETY PRECAUTIONS TO BE OBSERVED

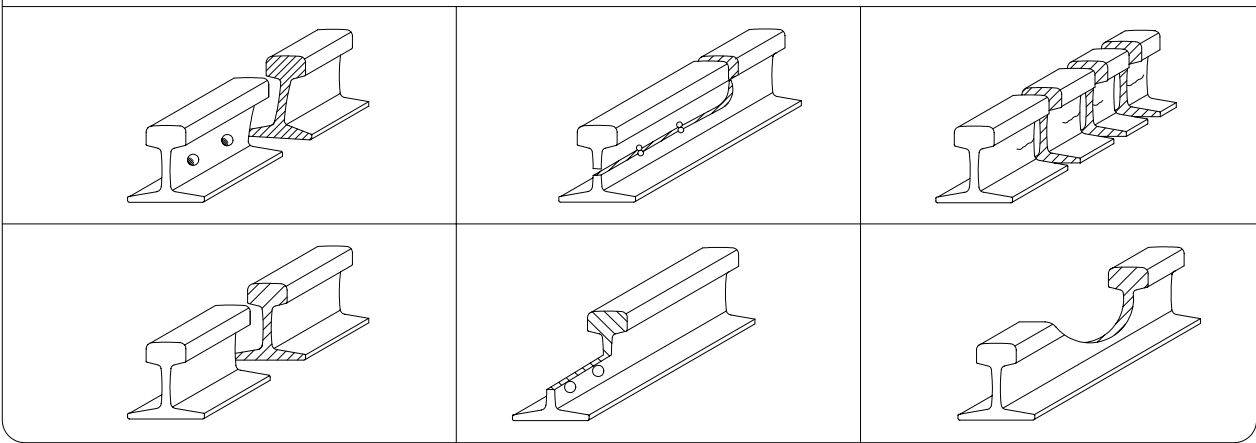
NO RESTRICTIONS (EXCLUDING HEAVY HAUL LINES)  
DEFECTS AS ILLUSTRATED, BUT NOT LONGER THAN 150mm

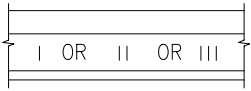
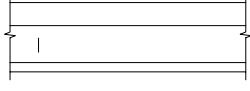
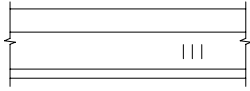
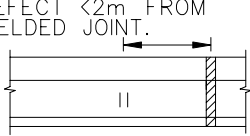

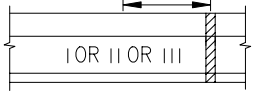
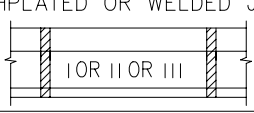
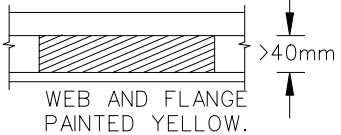
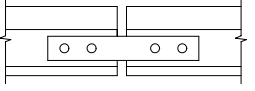
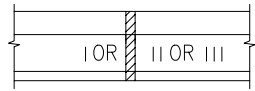
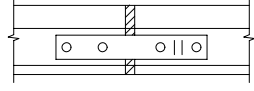
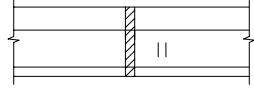
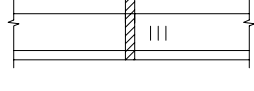


MAXIMUM SPEED 15km/h (EXCLUDING HEAVY HAUL LINES)  
DEFECTS AS ILLUSTRATED ABOVE, BUT LONGER  
THAN 150mm, PLUS THOSE ILLUSTRATED HERE.

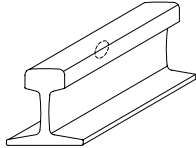
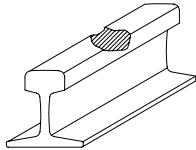
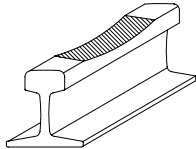
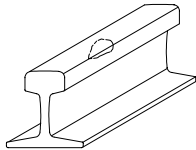
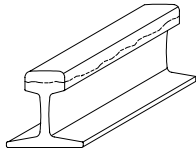
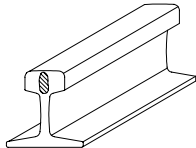
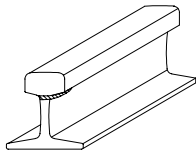
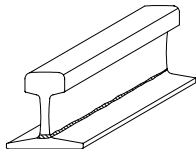


STOP WAIT FOR PERMANENT WAY STAFF  
DEFECTS AS ILLUSTRATED AND ALL OTHERS NOT SHOWN.

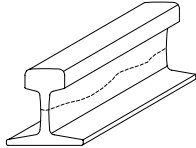
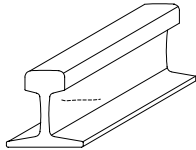
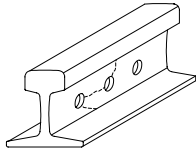
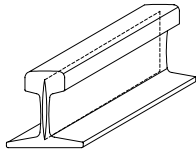


TYPE OF DEFECT	ULTRASONIC MARK	INDICATION OF ULTRASONIC DEFECT		ACTION	
TRANSVERSE FISSURE IN RAIL	<p>VERTICAL YELLOW STRIPES PAINTED ON RAIL WEB.</p>  <p>I = DEFECT &lt; 15mm II = 15 DEFECT &lt; 25mm III = DEFECT 25mm</p>	S - LINES		CUT OUT DEFECT IMMEDIATELY AND REPLACE WITH CLOSURE RAIL.	
		N1, N2 AND N3 LINES			CUT OUT DEFECT AND REPLACE WITH CLOSURE RAIL.
			DEFECT <2m FROM WELDED JOINT.		
			DEFECT >2m FROM WELDED JOINT.		
			DEFECT <2m FROM WELDED JOINT.		
		>1 DEFECTS BETWEEN FISHPLATED OR WELDED JOINT.		CUT OUT AND REPLACE TOTAL LENGTH BETWEEN JOINTS.	
PIPING IN RAIL	 <p>WEB AND FLANGE PAINTED YELLOW.</p>			CUT TOTAL PIPE LENGTH OUT AND REPLACE WITH CLOSURE RAIL.	
DEFECT AT FISHPLATED JOINT	 <p>BOTH FISHPLATES PAINTED YELLOW.</p>			REMOVE FISHPLATES AND IF CRACKS ARE VISIBLE, REPLACE THE WHOLE CRACKED RAIL OR PART OF IT WITH CLOSURE RAIL.	
DEFECT AT WELDED JOINT	<p>WEB OF RAIL PAINTED AT THE WELDED JOINT WITH VERTICAL YELLOW STRIPES. (EXCLUDING HEAVY HAUL LINES. SEE CHAPTER 20).</p> 	CRACK NOT VISIBLE.		STRENGTHEN WITH YELLOW PAINTED JOGGLED FISHPLATES.	
		CRACK VISIBLE.		IF CRACKS IS VISIBLE AFTER REMOVAL OF JOGGLED FISHPLATES, CUT OUT AND REPLACE WITH CLOSURE RAIL.	
				CUT OUT DEFECT IMMEDIATELY AND REPLACE WITH CLOSURE RAIL.	

CLASSIFICATION OF RAIL DEFECTS  
FOR ULTRASONIC TEST

TYPE OF DEFECT	CODE		COMMENTS	
	TYPE	SIZE		
1 TRANSVERSE DEFECTS IN RAIL HEAD (TRANSVERSE FISSURES)	TD	XX	WHERE XX DENOTES SIZE OF DEFECT C2, C1, G4	
2 SURFACE DEFECTS (VISUAL CROWN BREAK OUT) SHELLING, SPALLING, HEAD CHECKS	SD	XX	WHERE XX DENOTES SIZE OF DEFECT J2, J3, K1	
3 ENGINE BURN FRACTURE	TD/EBF	XX	WHERE XX DENOTES SIZE OF DEFECT J1	
4 MULTIPLE TRANSVERSE HEAD DEFECTS	TDX	XX	WHERE XX DENOTES SIZE OF DEFECT C1, C2, G4	
5 HORIZONTAL SPLIT HEAD	HSB	XX	WHERE XX DENOTES SIZE OF DEFECT LENGTH IN RAIL APPLICABLE A3, A4	
6 VERTICAL SPLIT HEAD	VSH	XX	WHERE XX DENOTES SIZE OF DEFECT LENGTH IN RAIL APPLICABLE A1, A2	
7 HEAD AND WEB SEPARATION	HW	XX	WHERE XX DENOTES SIZE OF DEFECT LENGTH IN RAIL APPLICABLE B1	
8 FOOT AND WEB SEPARATION	FW	XX	WHERE XX DENOTES SIZE OF DEFECT LENGTH IN RAIL APPLICABLE B3	

CLASSIFICATION OF RAIL DEFECTS  
FOR ULTRASONIC TEST

TYPE OF DEFECT	CODE		COMMENTS	
	TYPE	SIZE		
9 HORIZONTAL SPLIT WEB	HSW	XX	WHERE XX DENOTES SIZE OF DEFECT LENGTH IN RAIL APPLICABLE D1, B2	
10 SPLIT WEB VERTICAL TRANSVERSE	SW	XX	WHERE XX DENOTES SIZE OF DEFECT LENGTH IN RAIL APPLICABLE C5	
11 BOLT HOLE CRACK (ALL ANGLES)	BH	XX	WHERE XX DENOTES SIZE OF DEFECT LENGTH IN RAIL APPLICABLE C3, D2, K1, K2, G3	
13 PIPED RAIL	PR	XX	WHERE XX DENOTES SIZE OF DEFECT LENGTH IN RAIL APPLICABLE C5	
14 DEFECTIVE WELD	DW	XX	WELD INFORMATION MUST BE SPECIFIED IN REMARKS COLUMN. SIZES IN WEB AND HEAD MUST BE REPORTED SEPERATELY WHERE XX DENOTES SIZE OF DEFECT. H1 (FLASH BUTT WELD) H2,H3,H5,H6,H7 (THERMIT WELD) H4 (OTHER WELDS)	
17 BROKEN RAIL	BR		SIZE NOTATION NOT APPLICABLE G1,G2,G3,E1,E2,E3,E4,E5,C1,C2,F3	
18 MECHANICAL JOINT SUSPECT	MJS			
19 CORRODED RAIL	CR		SEE MANUAL FOR TRACK MAINTENANCE	