

KS

KOREAN INDUSTRIAL STANDARD

Testing methods for clad steel

KS D 0234 : 1992

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1. Scope

This Korean Industrial Standard specifies the testing methods for clad steel 8 mm or over in full thickness whose base metal is steel and cladding metal is stainless steel or non-ferrous metal, hereafter referred to as the "clad steel", used for pressure vessel, boiler, nuclear reactor, storage tank, etc.

Remark 1. The units and numerical values given in { } in this Standard are based on the Traditional System of Units and are appended for informative reference.

2. The relative standard of this standard is equal to attached list.

2. Definition of Terms

For the purposes of this Standard, the following definitions apply.

- (1) **clad** A composed metal whose base metal is covered with another metal throughout its surface with their boundary surfaces bonded together metallurgically. Also called "metallic clad". This term does not involve metallic plating.
- (2) **clad steel** A clad metal whose base metal is steel.
- (3) **base metal** A metal which is overlaid with another metal by cladding.
- (4) **metal** A metal to cover the base metal by cladding.
- (5) **roll clad steel** A clad steel manufactured by rolling process.
- (6) **clad steel** A clad steel manufactured by explosive cladding process.
- (7) **diffusion clad steel** A clad metal manufactured by diffusion bonding process.
- (8) **explosive roll clad steel** A clad steel manufactured by explosive cladding and rolling process.
- (9) **pad roll clad steel** A clad steel manufactured by padding and rolling process.
- (10) **cast roll clad steel** A clad steel manufactured by casting and rolling process.
- (11) **diffusion roll clad steel** A clad steel manufactured by diffusion rolling process.
- (12) **pad clad steel** A clad steel manufactured by pad welding method.

- (13) **rolling process** A process to manufacture a clad metal in which a cladding metal is laid on the base metal and then both of them are rolled and bonded together.
- (14) **explosive cladding process** A process to manufacture a clad metal in which a cladding metal is bonded to the base metal by an Erosion pressure of an explosive.
- (15) **diffusion joining process** A process to manufacture a clad metal in which the base metal and the cladding metal are made to adhere closely to each other, and pressurized, to the extent of incurring not plastic deformation at the meeting points or below of the metals, thereby allowed to be bonded together by means of the atomic diffusion generated on the joining surfaces.
- (16) **explosive cladding and rolling process** A process to manufacture a clad metal in which a cladding metal is bonded to the base metal by explosive cladding followed by hot rolling.
- (17) **padding and rolling process** A process to manufacture a clad metal in which a cladding metal is bonded to the base metal by pad welding followed by hot rolling.
- (18) **casting and rolling process** A process to manufacture a clad metal in which a cladding metal is combined to the base metal by casting and then both are hot rolled together.
- (19) **diffusion joining rolling process** A process to manufacture a clad metal in which the base metal and a cladding metal are diffusion-clad and then hot rolled.
- (20) **padding process** A process to manufacture a clad in which a cladding metal is bonded to the base metal by pad welding.
- (21) **full thickness of clad steel** The entire thickness of a clad steel as the thickness of a cladding metal to that of the base metal put together.
- (22) **cladding ratio** Ratio of thickness of a cladding metal to the full thickness of a clad steel(Percentage)
- (23) **face bend** Bending a clad metal with the cladding metal on the outside of the bend.
- (24) **root bend** Bending a clad metal with the base metal on the outside of the bend.
- (25) **side bend** Bending the side of a clad metal.
- (26) **searching surface** In an ultrasonic examination, the surface searched by the detector.
- (27) **dead zone** In an ultrasonic examination, a distance from the searching surface to the portion where the detector ceases to detect a flaw.
- (28) **boundary echo** In general an echo from the interface boundary of two media having different acoustic impedance (the value of sound velocity X density). In this Standard, however, it means an echo from the interface boundary between the base metal and a cladding metal.
- (29) **perfectly bonded portion** The bounded portion which, in an ultrasonic examination, presents no defective echo or so slightly defective one that it complies with the specified value.

- (30) **bottom echo system** In an ultrasonic examination, a system to detect flaws by adjusting the working sensitivity by means of a bottom echo reflected from the perfectly bonded portion of a test specimen.
- (31) **intensive detection** In an ultrasonic examination, a system to exhaustively search for defects either from the cladding metal side or from the base metal side.
- (32) **amount of ferrite** The amount of ferrite structure in the weld metal of austenitic stainless steel as expressed in percentage or FN (ferrite number).
- (33) **nickel equivalent** The amount of austenitized elements contained in the weld metal of austenitic stainless steel as converted into the nickel amount (mass percentage).
- (34) **chromium equivalent** The amount of ferritized elements contained in the weld metal of austenitic stainless steel as converted into the chromium amount (mass percentage).
- (35) **lining** A layer of some other substance (metallic, inorganic or organic or their combination) to cover the metal surface to protect it from rusting by screening it from the environment.

3. Chemical analysis

The analytical method for a chemical analysis of the predominant elements of cladding and base metals for a clad steel shall be in accordance with one of the following.

3.1 Analytical Method for Base Metal

- (1) In the case where the base metal is steels, steel castings or steel forgings.

KS D 1652	KS D 1655	KS D 1658	KS D 1659	KS D 1802	KS D 1803
KS D 1804	KS D 1805	KS D 1806	KS D 1807	KS D 1808	KS D 1809
KS D 1810	KS D 1811	KS D 1823	KS D 1825	KS D 1876	

The analytical method for elements other than mentioned above shall be in accordance with the relevant Korean Industrial Standard or subject to agreement between the parties concerned with delivery.

- (2) In the case where the base metal is stainless steel the analytical method shall be in accordance with (1) and, in addition, with the following Standards.

KS D 1821 KS D 1827

3.2 Analytical method for Cladding Metal

- (1) In the case where the cladding metal is stainless steel, the analytical method shall be in accordance with 3.1 (1) and (2).

- (2) In the case where the cladding metal is nickel or nickel alloys, the analytical method shall be in accordance with the following Standards.

KS D 1655	KS D 1659	KS D 1730	KS D 1789	KS D 1809	KS D 1821
KS D 1823	KS D 1825	KS D 1876			