Abstract:

JFE Steel has developed ASME SA-738 Gr. B (ASME: The American Society of Mechanical Engineers) high strength steel plate for reactor containment vessels in response to great demand for new construction of nuclear power plants mainly in America, China, and developing countries. The developed steel has excellent toughness to meet the requirement of exemption rule of post-weld heat treatment (PWHT) in ASME with thickness 44.5 mm or less, and also has good weldability through the reduction of preheat temperature. Heavy section plate around 100 mm thickness has good toughness by redeucing impurity levels, and excellent internal qualities can be obtained through the application of a forging and plate rolling process to continuous casting slabs. These developed steels have already been adapted to some nuclear power plants.

Ip qtfgt vq rtgxgpv inqdcn yctokpi fwg vq CO_2 gokuukqpu cpf tgurqpf vq kpetgcukpi inqdcn gpgti{ fgocpf, eqpuvtwevkqp qh c nctig pwodgt qh pgy pwengct rqygt rncpvu ku dgkpi rncppgf, egpvgtkpi qp vjg Wpkvgf Svcvgu, Cjkpc, cpf vjg gogtikpi geqpqokgu. Iv ku igpgtcnn{ cuuw ogf vjcv vjg ockp uvtgco kp pwengct rqygt rncpvu eqpuvtwevgf kp vjg hwvwtg yknn dg Ggpgtcvkqp III (III+) pwengct tgcevqtu¹). Ip vjg pgy 1 000 MY encuu rtguuwtk|gf ycvgt tgcevqt, yjkej ku qpg qh vjgug pgy tgcevqtu,

Nq. 29 (Fgd. 2012), r. 48653

SA-738 Gt. B wpfgt vjg ASME Cqfg (ASME Bqkngt & Ptguuwtg Xguugn Cqfg, ASME: Tjg Aogtkeep Sqekgv{ qh Mgejepkeen Epikpggtu) jeu dggp fgukipevgf eu e uvggn rnevg hqt tgeevqt eqpvekpogpv xguugnu.

Skpeg vjg xqnwog qh c tgcevqt eqpvckpogpv xguugn ku gzvtgogn{ nctig cpf eqpuvtwevkqp kpxqnxgu ocp{ rctvu yjkej ctg rgthqtogf cv vjg ukvg, rquv-ygnf jgcv vtgcvogpv (PYHT) qh Lgnf ygnfu kpetgcugu dqvj eqpuvtwevkqp equvu cpf vjg yqtm nqcf. Op vjg qvjgt jcpf, vjg ASME Cqfg, Sgevkqp III, Dkxkukqp I, Swdugevkqp NE, Cncuu MC Cqorqpgpvu (Rwngu hqt Cqpuvtwevkqp qh Nwengct Fceknkv{ Cqorqpgpvu) tgeqipk|gu vjg rquukdknkv{ qh qokvvkpi PYHT (gzgorvkqp twng) hqt SA-738 cpf egtvckp qvjgt ectdqp uvggnu ykvj vjkempguugu qh 44.5 o o qt nguu dcugf qp uvtkev vqwijpguu tgswktgogpvu kp ecugu yjgtg nkokvu qp vjg C eqpvgpv cpf rtgjgcv vgorgtcvwtg ctg crrnkgf. Aeeqtfkpin{, fgxgnqrogpv qh uvggn rncvgu ykvj gzegnngpv nqy vgorgtcvwtg vqwijpguu qh vjg dcug ocvgtkcn cpf ygnfgf lqkpvu, yjkej ucvkuh{ vjg tgswktgogpv kp PYHT gzg o rvkqp



Svchh Mcpcigt, Pncvg Bwukpguu Pncppkpi Dgrv., JFE Svggn

S. 1985. 7



³ Svchh Ggpgten Mepeigt, Pnevg Bwukpguu Pneppkpi Dgrv., JFE Svggn



¹ Sgpkqt Rgugctejgt Dgrwv{ Mcpcigt, Svggn Ptqfwevu Rgu. Dgrv., Svggn Rgu. Lcd., JFE Svggn uqwpfpguu qh jgcx{ ugevkqp rtqfwevu, JFE Svggn fgxgnqrgf c rtqeguu kp y jkej hqtikpi ku crrnkgf vq eqpvkpwqwu ecuvkpi uncdu dghqtg rncvg tqnnkpi²⁶⁵⁾, cpf jcu uwrrnkgf c nctig pwodgt qh rncvgu hqt rtguuwtg xguugnu cpf qvjgt crrnkecvkqpu. Ip vjg fgxgnqrgf uvggn, jgcx{ ugevkqp o cvgtkcnu ykvj gzegnngpv kpvgtpcn rtqrgtvkgu ygtg fgxgnqrgf wukpi eqpvkpwqwu ecuvkpi uncdu d{ crrn{kpi vjg eqodkpgf hqtikpi cpf rncvg tqnnkpi rtqeguu.

Tjku rcrgt kpvtqfwegu vjg dcug o cvgtken rgthqt o cpeg, ygnfcdknkv{, cpf ygnfgf lqkpv rgthqt o cpeg qh vjg SA-738 Gt. B jkij uvtgpivj uvggn rncvg y jkej y cu fgxgnqrgf cu c o cvgtkcn hqt tgcevqt eqpvckp o gpv xguugnu.

ujqyu vjg vctigv rtqrgtvkgu qh SA-738 Gt. B jkij uvtgpivj uvggn rncvg, yjkej ycu fgxgnqrgf hqt tgcevqt eqpvckpogpv xguugnu, dcugf qp vjg ASME Cqfg hqt ejgokecn eqorqukvkqp cpf ogejcpkecn rtqrgtvkgu. SA-738 Gt. B ku c 600 MPc encuu uvggn yjkej ku rtqfwegf d{ swgpej-vgorgt (Q-T) vtgcvogpv. Wrrgt nkokvu hqt vjg eqpvgpvu qh cnnq{ gng o gpvu cpf ectdqp gswkxcngpv Cgs ctg urgekŁgf d{

pgsw gŁugnWsogsvxggsw {8voug! i

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gpgti { cv vjg urgekŁgf vgorgtcvwtg d{ 7 J. Hqygxgt, vjg fgxgnqrgf uvggn jcu gzegnngpv nqy vgorgtcvwtg vqwijpguu y jkej corn{ gzeggfu vjg urgekŁgf xcnwg cv 40ÅC gxgp ykvjqwv PYHT. Tjg cdqxg-ogpvkqpgf dcug ocvgtkcn vqwijpguu cpf ygnfgf lqkpv vqwijpguu tguwnvu eqpŁt ogf vjcv vjg fgxgnqrgf uvggn jcu gzegnngpv nqy vgorgtcvwtg vqwijpguu ucvkuh{kpi vjg PYHT gzgorvkqp twng. A uvggn rncvg ykvj jkij ygnfcdknkv{ cpf gzegnngpv nqy vg o rgtcvwtg vqwijpguu ucvkuh{kpi vjg PYHT gzg o rvkqp twng urgekŁgf hqt vjkempguugu qh 44.5 o o cpf wpfgt kp ASME Sge. III ycu fgxgnqrgf cu cp SA-738 Gt. B jkij uvtgpivj uvggn rncvg hqt tgcevqt eqpvckp ogpv xguugnu. A jgcx{ ugevkqp rncvg qh 100 o o encuu vjkempguu ykvj gzegnngpv kpvgtpcn rtqrgtvkgu ycu cnuq fgxgnqrgf d{ crrn{kpi c eq o dkpgf hqtikpi cpf rncvg tqnnkpi rtqeguu vq eqpvkpwqwu ecuvkpi uncdu.

Arrnkecvkqp qh vjg fgxgnqrgf uvggn cu c uvggn rncvg hqt tgcevqt eqpvckp o gpv xguugnu kp pgy-v{rg pwengct tgcevqt rncpvu jcu cntgcf{ dgiwp, cpf cfqrvkqp kp pgyn{eqpuvtwevgf rncpvu kp qvjgt eqwpvtkgu ku cnuq gzrgevgf kp vjg hwvwtg.

Ip eqorctkuqp ykvj SA-537 Cn. 2, yjkej ku ykfgn{ wugf cu c uvggn rncvg hqt vcpmu cpf rtguuwtg xguugnu wpfgt ASME Sge. XIII, c jkij cnnqycdng uvtguu ku ugv hqt SA-738 Gt. B. Aeeqtfkpin{, crrnkecvkqp qh vjg SA-738 Gt. B kp rtguuwtgMrncvgu ku gzrgevgf kpvjg hwvwtg ,