Domments	Initial stress :	itate	
	Top Vielan	1785 m	
			similarit cosh deposits of 2500 kolor9
Calculated	Sv	43.78 Mpa	Vertical stress
Calculated	Sh	27,60 Mpa	Minimum horizontal stress (assumed as estimated fracturing pressure of Vieland Claystone) most likely should be higher
Assumed	SH	43,78 Mpa	Maximum horizontal stress
nput	Pp	20,30 Mpa	Pore pressure initial pressure in gas zone
Calculated	oeff 1	3,08475 Mpa	
Calculated Dreck	ShSh 0.5	0,630 5 - 0.88	Ratio min to max horizontal stress Ratio min to max horizontal stress from the Hoeve project
	Stress state a	fter depletion	
	Overburden pr	essure using an eq	ukalent rock density of 2500 kg/m3
Dalculated	Sv	43,78 Mpa	Vertical stress
Calculated	Sh	27,60 Mpa	Minimum horizontal stress (assumed as estimated fracturing pressure of Vieland Claystone)
Assumed	SH	43,78 Mpa	Maimum horizonal stress
Dalculated	neff 3	5 88475 Mno	Love burgering a solar burgering and the
Calculated Dheck	Sh/Sh 0, 0.5	630466 5 - 0.88	Ratio min to max horizontal stress Ratio min to max horizontal stress from DeHoeve project
Equation 1	K =E	(3*(1-2v)	Bulk modulus
nput from Table 4.2	Ec	7000 Mpa	Vieland daystone Young's modulus
rput from Table 4.2	Es	20000 Mpa	Vieland sandstone Young's modulus
nput from Table 4.2	vc vs	0,17	Vieland sandstone. Poisson's ratio
Calculated using Eq.1 Calculated using Eq.1	Ko Ka	3889 Mpa 10101 Mpa	Buk modulus Vieland claystone Buk modulus Vieland sandstone
Assumed Assumed	porosity porosity	8 % 0.2 fraction	Shale-blaystone Sandstone
rput from Table A1 Dalculated	Co Ca	0,50 Mpa 69,1 Mpa	Unconfined strenght of claystone: source Table A1 Estimated using Plumb correlation - unconfined strenght of sandstone
nput Table A5 nput Table A5	βc 0, βs 0,	000012 1/C 000017 1/C	Linear thermal exp. Coefficient Linear thermal exp. Coefficient
- Dalculated	00 05	0,695	Biot coefficient claystone Biot coefficient services
	us .	0,007	
riput	Sandstone stre Treservoir	ass change per ten 70 C 20 C	94 19
	Stress caused	by cold water inje	tion
Calculated	Short time colo	1 water injection	Churchana strans sharen is milioficial anded was
Calculated	Δσs	-10,2 Mpa	Sandstone stress change in cylindrical cooled zone
	Long time cold	water injection	
	Increase in Te	ansile stress due	to the cooling effect FRAT
Calculated	Δσc	-5,25 Mpa	Claystone stress change in cylindrical cooled zone - horizontal stress change $\sigma_{\pi} = \frac{i p t \Delta T}{2}$
Dalculated	Δσs -21),48193 Mpa	Sandstone stress change in cylindrical cooled zone - horizontal stress change $1 - v$
			1-A-r
Dalculated Dalculated	Xc Xs	0.521	Poro elastic constant - Sandstone $T = \frac{1 - 2 \cdot v}{1 - v} + it$ Poro elastic constant - Classtone
	Fracture open	ming pressure (v	ariation in reservoir pressure)
Estimated see above Calculated	Pf c Pf s	27,60 Mpa 16,178 Mpa	no change as no pressure change in claystone formation - cap rock depleted sandstone
	Fracture open	ning pressure (v	ariation in reservoir pressure + cooling effect)
Calculated	Pfc	22,35 Mpa	
Calculated	Pfs	-4,304 Mpa	
Calculated	Pfs	7,1 Mpa	reservir pressure back to initial
	Estimated Fff	ective stress Incl	urfinn coolinn effect
	geffc 14	3.33475 Mpa	Effective stress clavstone - caprock
Depleted	deffs 25	0.05744 Mpa	Effective stress sandstone at low pressure
o initial pressure	deffs 1	,25744 Mpa	Effective stress sandstone at elevated pressure
	Fracture oper	ing pressure 22.35 Mna	Gaustine , can not estimated fractive manning resource after continu from 70 to 20 C dea
	Plos	Мра	· · · · · · · · · · · · · · · · · · ·
o initial pressure	Plos	7,12 Mpa	Sandstone fracture openning pressure - pressure back to initial reservoir pressure
	Rock strengh		
Iniaxial compressive strenght		4,16 Mpa	Claystone
Iniaxial compressive strenght		11,9 Mpa	Sandstone
Censile strennit		0.42 Mra	Classifica
Fensile strenght		1,19 Mpa	Sandstone

Stress changes within the reservoir can be calculated if the appropriate			10000000000	Depth Atc	E	*	ABLE A.5 IB	erma properties to	e some rocks at	nd materials					
hydraulic and porcelastic parameters are known. The following equation can be employed to quantify the ratio between thermoelastic (or) and		Stratioraphy	Formation			-									
porcelastic (σ p) stresses due to injection and production in geothermal reservoirs:		North Free areas	Contractor Manager	(m TVD) [peecm]	[GPa]	N N	daterial	Linear thermal	Conditions	Thermal	Conditio	ions	Heat	Conditions	
$\frac{\sigma_T}{\sigma_n} = \frac{sp\Delta I}{\alpha \Delta p/K}$	Midd	le North Sea group	Cligocene	500-620 175-215	1.10 0	30		10 ⁶ (K ⁻¹)	1	Wm ⁻¹ K ⁻¹	0		Jkg ⁻¹ K ⁻¹		
			Upper Eccene	620-630 125-200	1.15 0	30 B	leres sit	13	100-200°C	2.34	20.90 /	dev			
where α is Biot's coefficient K is the bulk modulus, β is the linear thermal	Lowe	r North Sea group	Bruxelian sand	630-750 115-205	1.20 0	30 B	Bandera sst.	20	100-200 °C	1.70	20 °C, d	dry			
respectively. Unioxial deformation assumption (sides and bottom of reservoir			Paleocene day	950-1000 135-165	1.50 0	30 B	loise sst.	17	100-200 °C	1.47	20 °C, d	Iry	824-1000	25 °C. dry	
constrained) has been one of the most popular approaches to model the geomechanical behaviour of reservoirs. Assuming uniaxial boundary	Chab	CK	Omeland chalk	1000-1750 55-100	14 0	30 P	Pierre shale			1.30-1.70	35-75 "	C, 1-24 MPa	024-1000	as c, ary	
conditions where no horizontal strain occurs the ratio of changes in horizonta stress due to chrome in comparing and temperature can be	-		Texel chalk	1750-1820 60-90	12 0	30	demonstration in	12.20	20.7510	1.60.2.26	saturate 25. pp.1	id in a state.			
estimated. $\frac{\Delta S_h}{\Delta P} = -\frac{1-2\nu}{1-\nu}\alpha$	Rijnia	and group	Vileland claystone	1000 1075 85-120	7 0	20	THE CO PLANE	10-20	0-7 MPa	100-110	saturate	d			
ar = r			Vileland sandstone	1080-1875 75-85	20 0	17 Q	uccension shale	e 11–13	20-75 °C	1.74-1.95	35-90 "	C, 1-24 MPa			
where the is the endowing backward stress with the Released state and the	Zech	stein group	Anhydrite	1873-1920 50-65	50 0	28 20 Q	Quartz 1 c*	18	20-100 °C		saturate	u			
where Sh is the minimum horizontal stress, v is the Poisson's ratio and the right hand side is equal to porcelastic stress coefficient. Thermoelastic stress	Uppe	r Rotliegend group	Slochteren sandstone	1990-2080 65-95	20 0	20	10	10	20-100 °C	13	0°C		735	0 °C	
and strain evolution due to temperature variations in uniaxial boundary conditions can be estimated accordion to the following equation:	Date	ment			22 0	20 C	alcite 1 c	24	20-100°C 20-100°C						
$\sigma_T = \frac{E\beta\Delta T}{2}$	• E=49.1	14216 0.790681	×¢			A	Aluminium	23.1	25 °C	200	27 °C		900	25 °C	
-1 - y						V	Vater	70**	20 °C	0.6	20 °C		4182	20 °C	
	none of th	iem can help us ev	aluate the magnitude a	nd orientation of the st	ress field. H	owever,									
where E is the Young's modulus and Epi(1- v) is the thermoelastic stress coefficient.	minimum ((maximum) horizoni	al stress to the vertical	stress at the depth of	the reservoir	r is 0.55	*Computed fro	om volumetric expa	ansion.						
$c = \frac{1+v}{RAT}$	The orients	ation of the stress !	eld can be assumed to	be the regional trend as	s given by th	w World									
$1 - v^{1/21}$	stress map	project Figure 4-2,	that is NW-SE.												
	1.							TABLE A.3 Den	sity, elastic mos	deli and sour	ad velocits	es for some con	amon maleria	als	
An increase in temperature causes an increase in volume and results in	Biot's C	Constant is the ra he fluid is free to r	tio of the volume char sove out of the rock lie	ge of the fluid filled p , the hydraulic pressu	corosity to the	he volume change of unchanged).	the	Material	Density p	Bulk m	odulus	Shear modulu	o P-wave	e velocity	S-wave vel
compressional thermoelastic stress. A decrease in temperature causes a reduction in volume and results in tensile stresses. Thermoelastic effects	For rock wit	h normality							103 (kg/m3	5) K (GP:	a)	G (GPa)	np (km	1/s)	$\upsilon_{S}\;(km/s)$
predominates in case of increase in rock mechanical stiffness, which could	1: ALPH	A = 1 . Kb / Km						Calcite	2.71	7/	4.0	27.5	6	5.39	3.18
defined as the contribution of pore pressure to the total stress, i.e. the	For rock war	h no perosity. Kh.	Km so Al PHA - *					Quartz (or)	2.65	37	1.5	41.0	5	5.90	3.94
encouncy or pore raid in counteracting to the total applied stress. $\sigma^{eff} = \sigma + \alpha P$	If share trees	el time is unamite	his this empirical sub-	tion may be market.				(mica)	2.79	52	-02	31-41	3.78	5-0.40	3.33-33
o ··· – o · · ar p	3: ALPH	A = 1 - (1 - PHID) *	KS8	and the second s				Biotite	3.05-3.12	41-	_60	12-42	4.3	5-6.8	2.00-3.
	where KS8	has the range 2 to	3, with KS8 = 3 most o	ten used.				Peldspar (average)	2.63	7	0	26	4	1.68	2_39
Particular Statistics and a State and state					_			Pyrite	4.93	14	7.5	132.5	8	\$.10	5.18
sock we see in sense mode if the minimum effective principal stress secones tensile and equal to the tensile strength of the rock (Fjaer, Holt,								Dolomite	2.87	76	-95	45-52	6.93	3-7.34	3.96-4.
foranud, & Rasen 1992) attr = d + 1 attr = d + attr		**		S.				Olivine	3.32	1	30	80	8	8.54	5.04
of a contrast of the operate			·					Steel	7.9	198	-205	57-80	5.5	9-6.3	2.7-3.
		1						Water (fresh)	2.7	77.	-96	23-26	6.3	5-7.0 1.50	2.9-3.
In situ stress state The minimum horizontal stress (Sh) magnitude is evaluated by hydraulic		\$**						lee	0.9				1.3	3-1.7	
fracturing to be > 27.6 MPa. The vertical stress (Sv) was estimated by considering the average weight of the overburden strata and the thickness of						1		Crude oil (room	0.7-1.1	1.2	-2.8		1.3	3-1.7	
the rock units. An equivalent density of 2500 kg/m3 for the entire overburden		41	Data from					Air	0.14 - 10-3	3 0.15	- 10-3		0	0.33	
Consequently, vertical stress is equal to 43.8 MPa at a depth of 1785 meters			826 87 879	10 10 10	120 1	64.		(atmospheric							
The most uncertain component of stress tensor is maximum horizontal stress (SH). Jaeger et al. (2007) derived the ratio between effective principal	.		Dist. Com	ies Parantip, fraction				press.) Plexielass	1.2				7	2.55	1.28
stresses as a function of sliding friction coefficient, which can be employed to				IN WYROS DOPOSALY				F-4 - 4	0.70	0	00			1.06	
give the bounds on BH. Morek et al., (2006) employed this approach and stated that the maximum horizontal stress is equal or less than normal strate D^{-1} . In strike slip faulting regime it is equal or less than varied strate D^{-1} . Therefore, $ = e^{-2ff} = \frac{1}{2} (C_{n+} + C_{n+} + C_{n+}) = P_{n-}$: calculated by:	In the absent known or as equation is 4: ALPH	nce of good shear sumsed lithology (s greater than 2.0. T A = 0.62 + 0.935 ° F	conic data, Biot's Cone cortexy Barree and As he empirical straight I file	ant can be estimated sociates). This graph s ne fit to the data is:	from the gro loggests KS	aph above, based on 8 in the previous		TABLE A 2 Static a	nechanical near	netics for so	me specifi	e mela			
give the bounds on SH. Moosk et al., (2008) employed this approach and the state of the the maximum horbitral strates is equal or less than 0.78 six is normal faulting regime. In strates tip faulting regime is a equal or less than normal strate of the strate of the strates of the strategies of the	In the absent known or as equation is 4: ALPH Rock Specific	nce of good shear marned lithology (greater than 2.0. T A = 0.62 + 0.935 * 5 : Heat	sonic data, Bio's Com partary Barree and As he empirical straight I 186	ant can be estimated sociates). This graph s ne fit to the data is:	from the gra ioggests KS	aph above, based on 8 in the previous	T	FABLE A.2 Static n Material	nechanical prop	perties for so Young's me	ane specifi sdulus P	ic rocks 'oisson's ratio	Unconf. co	mpr. T	ensile streng
give the bounds on SH Macké et al. (2008) employed the approach mining the the bounds on SH Macké et al. (2008) employed the approximation of SH Mining and the set of SH Mining and SH Mining a	ha the abser known or as equation is 4: ALPH Rock Specific The Data was	toe of good shear samed lithology (r greater than 2.0. T A = 0.62 + 0.935 * 5 : Heat heat data was a s converted to res	eonic data, Bio's Core ourtany Barree and As to empirical straight I 1980 élio taken from the li ervoir conditions [17]	ant can be estimated sociates). This graph s ne fit to the data is: lerature and was inc	from the gra suggests KS	aph above, based on 8 in the previous into the model.	T	FABLE A.2 Static #	nechanical prop Density ρ 10 ³ (kg/m ³)	perties for so Young's mc E (GPa)	me specifi sdulus P	ic rocks Poisson's ratio	Unconf. cos strength Co	empe. T 1 (MPa) 7,	ensile streng 0 (MPa)
give the bornd an GH Moack et al. (2000) employed the approximation of the magnetization of the second state of the secon	Is the absent income or as equation is 4: ALPN Rock Specific The Data was Table 3-8 Rock	nce of good shear isomed lifeology (i greater than 2.0. T A = 0.62 + 0.935 * 5 : Heat : heat data was a s converted to res ok Specific Heat	ionic data, Bior's Cone ourbay Barree and As he empirical stolight I 980 also taken from the I ervoir conditions [17] as a function of Te	ant can be estimated sociates). This graph is no fit to the data is: lerature and was inc mperature	from the gr auggests KS	aph above, based on 8 in the previous into the model.	T N B	Ethanoi IABLE A.2 Static n Material ted Vildmoor	mechanical prop Density ρ 10 ³ (kg/m ³) 1.9–2.0	young's mc E (GPa)	me specifi xdulus P	ic rocks Poisson's ratio	Unconf. co strength C ₀ 14	empe. T 3 (MPa) 7	'ensile streng 0 (MPa) 0.4–0.7
give the boards on SH Modek et al. (2005) employed this approximate and applied that the momentum of the state (2.75 keV) and the state (2.75 keV) are strated and the state (2.75 keV) are strated and applied to the state (2.75 keV) are strated and applied to the state (2.75 keV) are strated and applied to the state (2.75 keV) are strated and applied to the strategy strategy are strategy and applied to the strategy strategy are strategy and applied to the strategy are strategy and applied to the strategy strategy are strategy and applied to the strategy strategy are strategy and applied to the strategy are strategy are strategy and applied to the strategy are strategy are strategy and applied to the strategy are strategy are strategy and applied to the strategy are stra	s the abuer known or as equation is 4: ALPH Rock Specific The Data was Table 3-8 Ro	nor of good shear sumed lifeology (groater then 2.0. T A = 0.52 + 0.535 * 5 :Heat : heat data was : converted to res ok Specific Heat mp. *C Co Ros	toric data, Bior's Cone ourbay Barree and As he empirical stellight I the sto taken from the I ervoir conditions [17] as a function of Ter k.	ant can be estimated sociates). This graph a ne fit to the data is: letature and was inc nperature	from the gr suggests KS	aph above, based on 8 in the previous	T N B V V	Ethanoi TABLE A.2 Static n Material ted Wildmoor [⊥] andstone ¹	0.79 mechanical prop Density ρ 10 ³ (kg/m ³) 1.9–2.0 1.9–2.0	Young's mc E (GPa) 1.8 1.3	me specifi sdulus P	ic rocks Poisson's ratio /	Unconf. co strength C ₀ 14 7	empe. T 3 (MPa) 7	ensile streng 0 (MPa) 0.4–0.7 0.4–0.7
give the bonds in this Medical at L (2000) employed This approximate and more more limited in the provide the second and more more limited in the provide the second seco	Is the abure known or as equation is 4: ALPIN Rock Specific The Data was Table 3-5 Ro	non of good shear surmed liftelogy (s greater than 2.0. T. A = 0.62 + 0.935 * 5 Heat heat data was a converted to res ok Specific Heat mp, *C Cp Rom state and state was a converted to res	sonic data, Silofs Cone ourtary Barnee and As he empirical straight II tille also taken from the II envoir conditions [17] as a function of Ter k,	ant can be estimated sociates). This graph s ne fit to the data is: erature and was inc sperature	from the gra noggests KS	aph above, based on 8 in the previous	T N B V S S V	TABLE A.2 Static n Material 1 Red Wildmoor [⊥] andstone ¹ Weak reservoir	0.79 nechanical prop Density ρ 10 ³ (kg/m ³) 1.9–2.0 1.9–2.0 1.9	perties for so Young's me E (GPa) 1.8 1.3 0.4	me specifi xdulus P v	ic rocks Poissen's ratio /	Unconf. co strength Co 14 7 1	enpe. T 3 (MPa) 7	censile streng 0 (MPa) 0.4–0.7 0.4–0.7
$\begin{split} & por Particular on Det March et al., 2000 environt the approximation of the March et al., 2000 environt the approximation of the March et al., 2000 environt the approximation of the March et al., 2000 environt the M$	s the absent known or as equation is - 4: ALPH Rock Specific The Data was Table 3-8 Ro Te 22C	too of good shear surmed lifeology (greater than 2.0. T. A = 0.62 + 0.935 * 5 Heat heat data was a converted to res ok Specific Heat mp, *C Cp Rom k.21m 25 2210	control common control daws. Next North Common control daws. Next Next North Common daws of the control of the the environ conditions (177) as a function of Ter k,	ant can be estimated sociality. This graph a ne fit to the data is: letature and was inc apperature	from the gr nuggests KS	aph above, based on 8 in the previous into the model.	T 	Ethanoi FABLE A-2 Static = Material Red Wildmoor [⊥] andstone ¹ Veak reservoir andstone North Sea)	0.79 nechanical prop 10 ³ (kg/m ³) 1.9–2.0 1.9–2.0 1.9	young's me E (GPa) 1.8 1.3 0.4	me specifi sdulus P v	ic rocks Poisson's ratio / 0.45	Unconf. co strength C ₀ 14 7 1	enpe. T 3 (MPa) 7,	ensile streng 0 (MPa) 0.4-0.7 0.4-0.7
$\rho_{\rm P}$ is both on CPV Model at , 2000 empired this approach and the model of the constraints of the cons	Is the abure known or a equation is d: ALPM Rock Specific The Data was Table 3-5 Ro Ter Z2C	too of good shear surmed lifeology (r greater than 2.0. T A - 0.52 + 0.535 + 1 Heat theat data was is converted to rais occoverted to rais occoverted to rais converted to rai	EVEN COMMUNICATION CONTRACTOR CON	ant can be estimated sociality). This graph a ne fit to the data is: senature and was inc inperature	from the gr nuggests KS	aph above, based on 8 in the previous	T 	Emanot TABLE A.2 Static a Material Red Wildmoor Wildmoor Wildmoor Wildmoor Nonh Sea) Screa sandstone	0.79 mechanical pro ₁ Density ρ 10 ³ (kg/m ³) 1.9–2.0 1.9–2.0 1.9–2.18	young's me E (GPa) 1.8 1.3 0.4 20	me specifi adulus P v	ic rocks Poisson's ratio / 0.45 0.38	Unconf. co strength C ₀ 14 7 1 7 4	supe. T	censile streng 0 (MPa) 0.4-0.7 0.4-0.7
$\begin{split} & \text{def } B \log d a \ \text{ for } M \log d \ \text{ al} \ , \ & \text{Odd} \ \text{ all } \ , \ & \text{Odd} \ \text{ all } \ \text{ all }$	Is the abure Increm or as equation is exactly Rick. Specific The Data was Table 3-6 Ro	sca of good shear series ilthology (c) greater then 2.0. T A = 0.62 + 0.935 * I heat beat beat beat beat converted to res converted to res converted to res ckstmin 25 2219 127 2540 25 2217 25 2217 25 2217 25 2217 25 2217	EVEN COMPARENCE OF COMPARENCE	ant can be estimated sociality. This graph a refit to the data is:	from the gr nuggests KS	aph above, based on 8 in the previous	T 	Emanot TABLE A.2 Static t Material Material Red Wildmoor ¹ weak reservoir andstone North Sea) Serea sandstone i. Peter andstone	0.79 mechanical proj 10 ³ (kg/m ³) 1.9–2.0 1.9–2.0 1.9 2.18 2.34	v young's mc E (GPa) 1.8 1.3 0.4 20 4–10	nne specifi odulus P v	ic rocks Poisson's ratio / 0.45 0.38 0.05-0.10	Unconf. co strength C ₀ 14 7 1 74 37	enpe. T 3 (MPa) 7,	iensile streng 0 (MPa) 0.4-0.7 0.4-0.7
$\rho_{\rm B}$ is back of the Macci et al. (2000) ensuper the approximation of the Macci et al. (2000) ensurematic the properties of the Section of the Macci et al. (2000) ensurematic the properties of the Section of the Macci et al. (2000) ensurematic the Macci et al. (2000) ensuremat	Is the absert known or as equation as equation as equation as equation as equation as equation as Rock. Specific Pack specific The Data was Table 3-6 Ro Ten Z2C	soar of good shear soarad lithology (c) greater then 2.0. T A = 0.62 + 0.933 * I b. heat b. heat b. heat b. heat b. converted to res ck.hmn 25 2219 127 2530 25 2219 25 2212 25 2212 25 2212 25 2212 25 2212 25 2212 25 2212 25 2212 25 2212 25 2212 25 2212 25 2212 25 2212	Los o como conte data, Bioris Cone soutrary Barree and As he empirical society in the empirical society in the the taken from the ii the the taken from the ii the taken from the ii the taken from the taken from the taken from the taken taken from the taken from taken fr	ant can be estimated sociality. This graph a ref fit to the data is: tenature and was inc nperature	from the gr uuggests KS	aph above, based on 8 in the previous	T 	Emanot TABLE A.2 Static r Material Mildmoor [⊥] middtone ¹ Weak reservoir andstone North Sea) Seres andstone it. Peter andstone Veak shale	0.79 mechanical proj 10 ³ (kg/m ³) 1.9–2.0 1.9–2.0 1.9 2.18 2.34 2.35	v perties for se E (GPa) 1.8 1.3 0.4 20 4–10 1	sme specifi sdulus P v	ic rocks Poisson's ratio / 0.45 0.38 0.05-0.10	Unconf. co strength C ₀ 14 7 1 74 37 6	enpr. T j (MPa) 7,	consile streng ₀ (MPa) 0.4–0.7 0.4–0.7
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<equation-block><equation-block><text><text></text></text></equation-block></equation-block>	the state of	an off-generative set of the set	$\begin{array}{c c} \label{eq:constraint} \begin{tabular}{lllllllllllllllllllllllllllllllllll$	are can be entitled as the second se	hose the group of the second s	the barryshard on the sector of the sector o	1 - - - - - - - - - - - - -	International and a second a	0.57 0.57 mechanical preprint 19-20 19-20 19-20 19-21 19-20 19 218 234 234 235 224 239 24 241 24 259 164 244 256 259 164 262 259 164 19-62 193 262 259 1.41 12-5.47 12-3.23 12-5.47 12-3.24 12-3.22 12-3.24 12-3.24 12-3.24 12-5.47 12-3.24 12-3.24 12-3.24 12-3.25 12-3.24 12-3.24 12-3.24	v v v	see specifi dulus F 12 r some com modulus i-0.1 -70 -5-5 -30 -30 -30	is reds 0.45 0.45 0.35 0.45 0.35 0.45 0.35 0.45 0.35 0.45 0.22 0.22 0.23 0.25 0.22 0.23 0.31 0.34 0.31 0.35 0.3	Uncord c or strongh C strongh C 14 7 15 7 15 15 15 15 15 15 15 15 15 15	ange 1 (MPA) 7 (MPA) 7 1 1 1 1 1 1 1 1 1 1 1 1 1	ensile streng (ABPs) 0.4-0.7 1.6 4.0 3.0 1.4 0.8 5.2 Tensile str 7 ₆ (MPs) 0.6 5.2
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<equation-block><equation-block><text><text><section-header><figure></figure></section-header></text></text></equation-block></equation-block>	the state of	$\label{eq:constraint} \begin{array}{c} \mbox{scale} \m$	$\begin{array}{c c} & \text{inter} \ (\text{Construction} \ ($	$\label{eq:second} \begin{array}{c} \text{and cases is enhanced} \\ \text{metabers and uses ine } \\ meta$	hose the group of the properties of the properti	the barryshared on the sector of the sector	1 - - - - - - - - - - - - -	International Control of Control	0.57 0.57 mescharized prin 1.9-2.0 1.9-2.0 1.9-2.0 1.9-3.0 1.9-3.0 1.9-3.0 1.9-3.0 1.9-3.0 1.9-3.0 2.13 2.34 2.23 2.23 2.24 2.24 2.16 2.16 2.16 2.16 2.16 2.16 2.17.2.00 2.21 2.24 2.24 2.25 2.24 2.24 2.24 2.25 2.24 2.24 2.24 2.25 2.24 2.24 2.24 2.25 2.24 2.24 2.24 2.24 2.42 2.42 2.42 2.42 2.42 2.42 2.42 2.42 2.42 2.42 2.42 2.42 2.42 2.42 2.42 2.42 2.42 2.42 2.42	v v v	20 me specifi daths I v v 12 r come come modulus 12 12 12 12 12 12 12 12 12 12	k maks 0.45 0.45 0.45 0.35 0.35 0.35 0.35 0.27 0.22 0.22 0.21 0.31 0.16 0.31 0.16 0.31 0.16 0.31 0.16 0.31 0.16 0.31 0.16 0.31 0.16 0.32 0.27 0.08 0.16 0.07 0.07 0.08	Unconf. or of 14 7 1 14 7 1 14 7 1 14 7 1 14 7 1 1 1 1	ange 1 (MPA) 7	Tensile star 0.4-0.7 1.6 4.0 3.0 1.4 0.6 5.2 Tensile sta 7.6 (MPa) 1.6 1.6 1.6 1.6 1.6 1.6 1.6 1.6
<equation-block><text><text><text></text></text></text></equation-block>	the state of	$\begin{array}{c} \mbox{ord} \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \$	where the strength of the str	are can be set in the data to the the data to the dat	hose the ground of the second	the above, have of an experience of the second of the seco	-50 m	TABLE A.2 Starte Material Mater	0.57 0.57 mechanical prin 19-20 19-20 19-20 19-21 19-20 19-22 20 234 234 24 224 262 227 262 234 264 264 10 ² 0.0 ²⁰ /4 164 10 ² 0.0 ²⁰ /4 15-17 12-20 15-17 12-20 15-17 12-20 164 12-14/17 12-24 24-24 24-24 24-24 24-24 24-24 24-24 24-24 24-24 24-24 24-24 24-24 24-24 24-24 24-24 24-24 24-24 24-24 24-24 24-24 24-24 24-24 24-24 24-24 24-24 24-24 24-24 24-24 24-24 24-24 24-24 24-24	u u Young's m m I.8 I.3 1.4 I.3 0.4 I.4 0.77-1, 20 0.4 I.0 0.77-1, 20 0.4 20 5 5 21 21 1.5 1.4 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 5.0 5.0 5.0 5.0 5.0 5.0 5.0 5.0 5.0 5.0 5.0	see specifi deduks F 12 12 12 12 12 12 12 12 12 12 12 12 12	r maks /	Unconf. co strength G, g 14 7 1 7 1 7 1 1 1 1 1 1 1 1 1 1 1 1 1	анре 1 1 (МРА) 2 1 (МРА) 2 1 1 1 1 1 1 1 1 1 1 1 1 1	Inclusion of the second
<equation-block><equation-block><text><text><section-header><figure></figure></section-header></text></text></equation-block></equation-block>	the state of	$\label{eq:second} \begin{array}{c} \mbox{second} \mbox$	$\begin{array}{c c} \label{eq:constraint} \mbox{the stars} the$	$\label{eq:second} \begin{array}{c} \text{and model} \\ \text{metalure and uses inc} \\ metalu$	hon the graph of the properties of the propertie	the barrys hand on the sector of the model.	1 - - - - - - - - - - - - -	International Control of Control	0.07 0.08 meshanizati prip 18-2.0 19-2.0 19-2.0 19-3.0 19-3.0 19-3.0 19-3.0 19-3.1 19-3.0 2.13 2.3 2.23 2.31 2.24 2.31 2.41 2.16 2.16 2.16 2.17.2/P 2.21 2.24 2.24 2.34 2.41 2.46 2.32 2.3-24 2.32 2.3-24 2.32 2.3-24 2.32 2.3-24 2.32 2.3-24 2.32 2.3-24 2.32 2.3-24 2.32 2.3-24 2.32 2.4-25 2.4-24 2.4-32 2.4-32 2.4-32 2.4-32 2.4-32 2.4-32 2.4-32 2.4-32 2.4-32 2.4-32 2.4-32 2.4-32 2.4-32 2.4-32	v v v	see specifi dathes I ()) 12 12 12 12 12 12 12 12 12 12 12 12 12	k maks 0.45 0.45 0.35 0.35 0.35 0.35 0.35 0.22 0.22 0.22 0.21 0.31 0.16	Unconf. co sequence of the sequence of the se	ange 1 (MPA) 7 (MPA) 7 1 1 1 1 1 1 1 1 1 1 1 1 1	Include strong (MMPs) 0.4-0.7 0.4-0.7 0.4-0.7 0.4-0.7 0.4 0.4 0.8 0.6 3.2 7 6 (MPs) 10-15 3-15 30.0,37

