निर्माण प्रबंधन (Construction Management) के सिद्धांत

[Nirman prabandhan (Construction Management) ke Siddhant]

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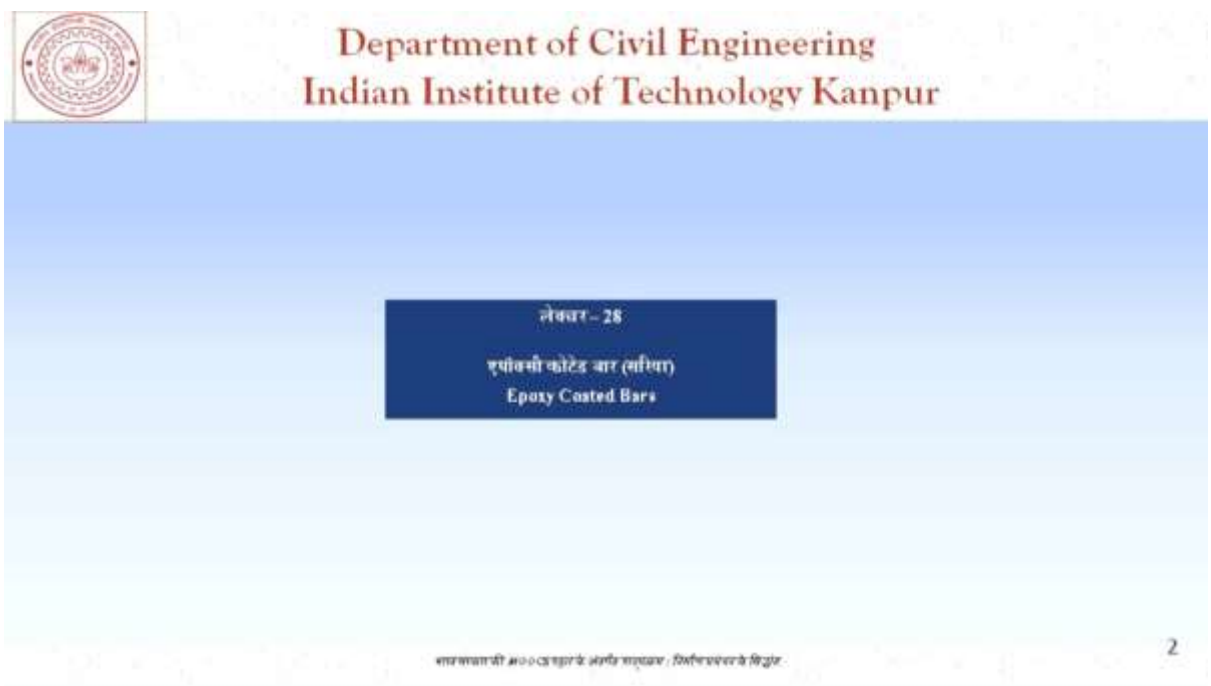
Lecture– 28

Epoxy Coated Bars

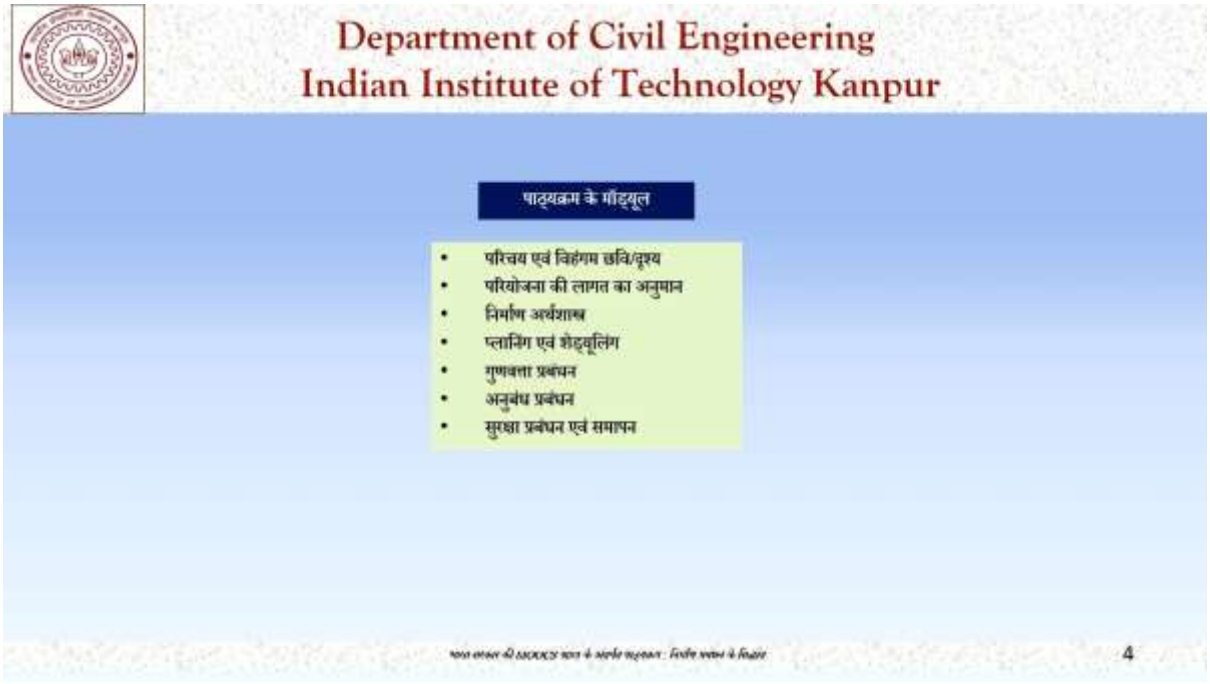
Namaskaar aur svaagat hai aapaka Bhaarat sarakaar kee MOOCS pahal ke antargat paathyakram Nirmaan Prabandhan Ke Siddhaant.

(Reference Time 00:21)



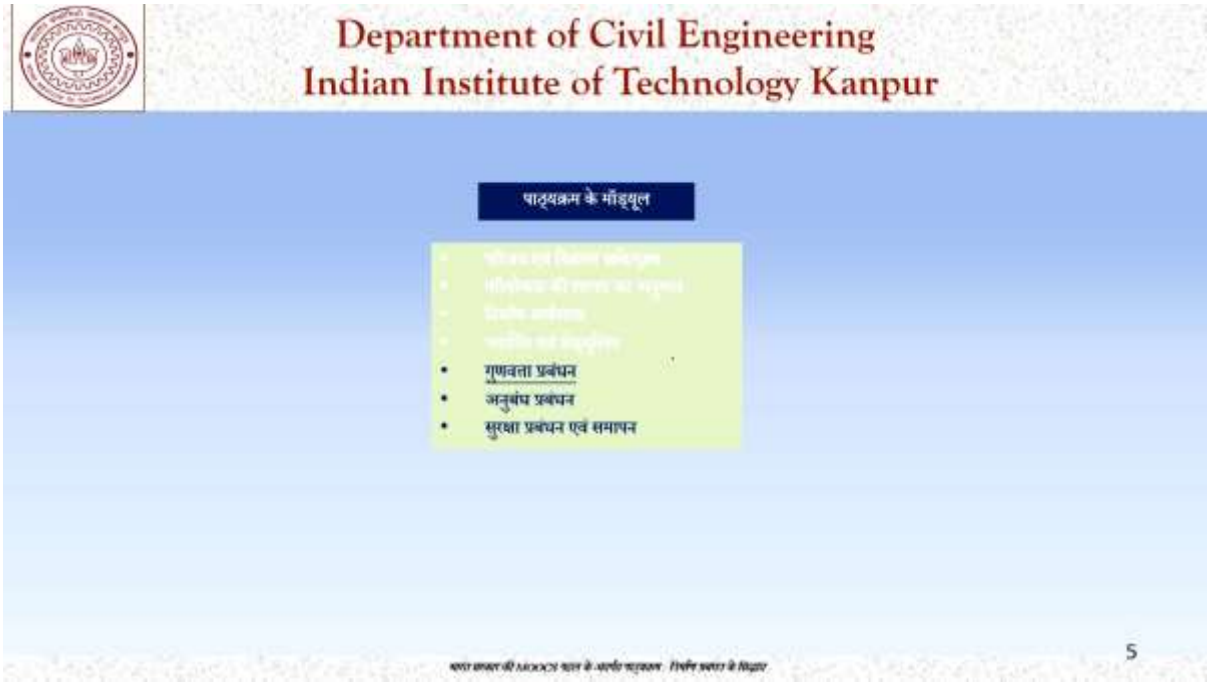
Aaj ham log hain lecture 28 par aur charcha rahegee Epoxy Coated Bars par.

(Reference Time 00:28)



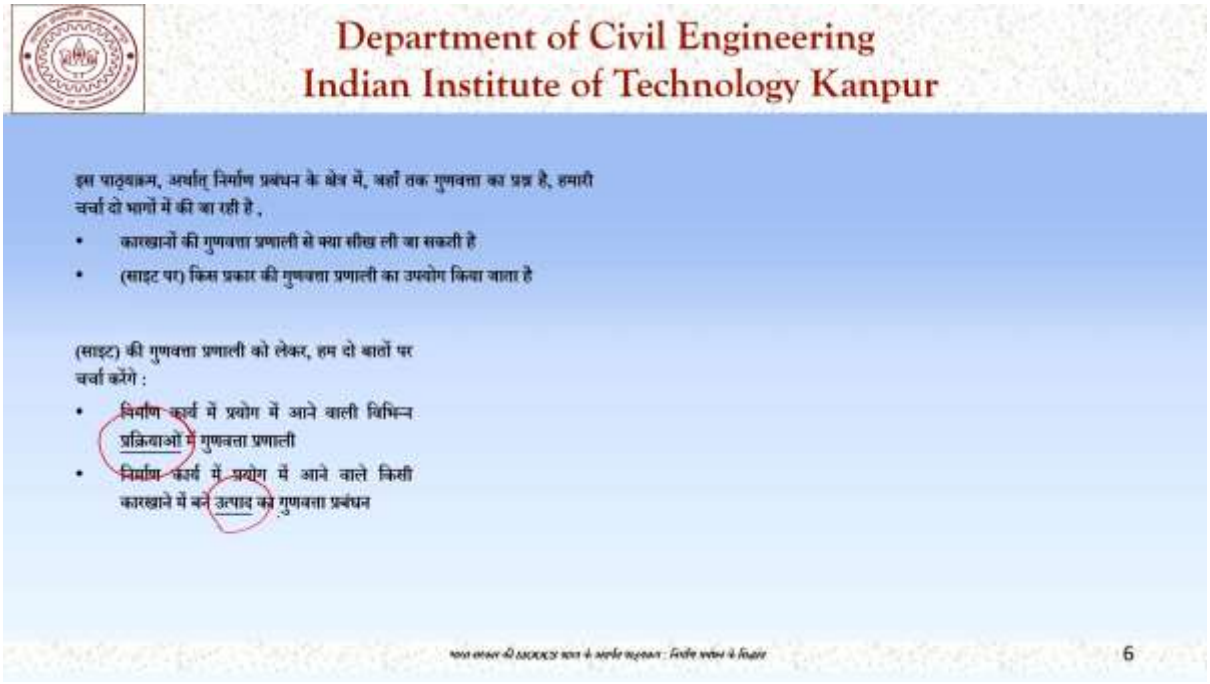
Yah paathyakram ke module hain.

(Reference Time 00:29)



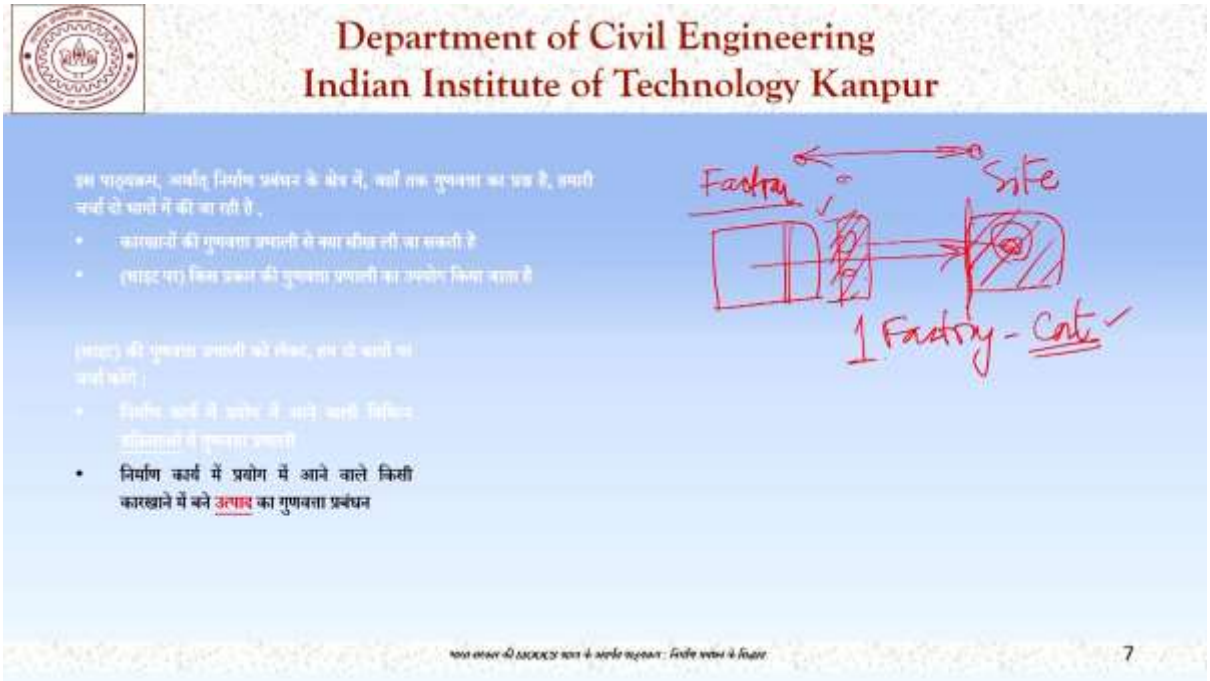
Aur ham charcha kar rahe hain gunavatta prabandhan (Quality Management) kee.

(Reference Time 00:34)



Is slide par ham pahale bhee charcha kar chuke hain aur ek bar phir dohara den ki is paathyakram arthaat nirmaan prabandhan ke kshetr mein jahaan tak gunavatta ka prashn hai hamaaree charcha do bhaagon mein kee ja rahee hai. Kaarakhaanon kee gunavatta pranaalee se ham kya seekh le sakate hain aur site par kis prakaar kee gunavatta pranaalee ka upayog kiya jaata hai. Aur jahaan tak site par upayog kee jaane vaalee gunavatta pranaalee ka prashn hai vahaan bhee hamane do bhaagon mein apanee charcha ko vibhaajit kiya hai, ek hai prakriyaon se sambandhit jis par ki pichhale lecture mein hamane welding par charcha kee thee aur doosaree hai nirmaan kaary mein prayog mein aane vaale kisee kaarakhaane mein bane utpaad ke bare mein.

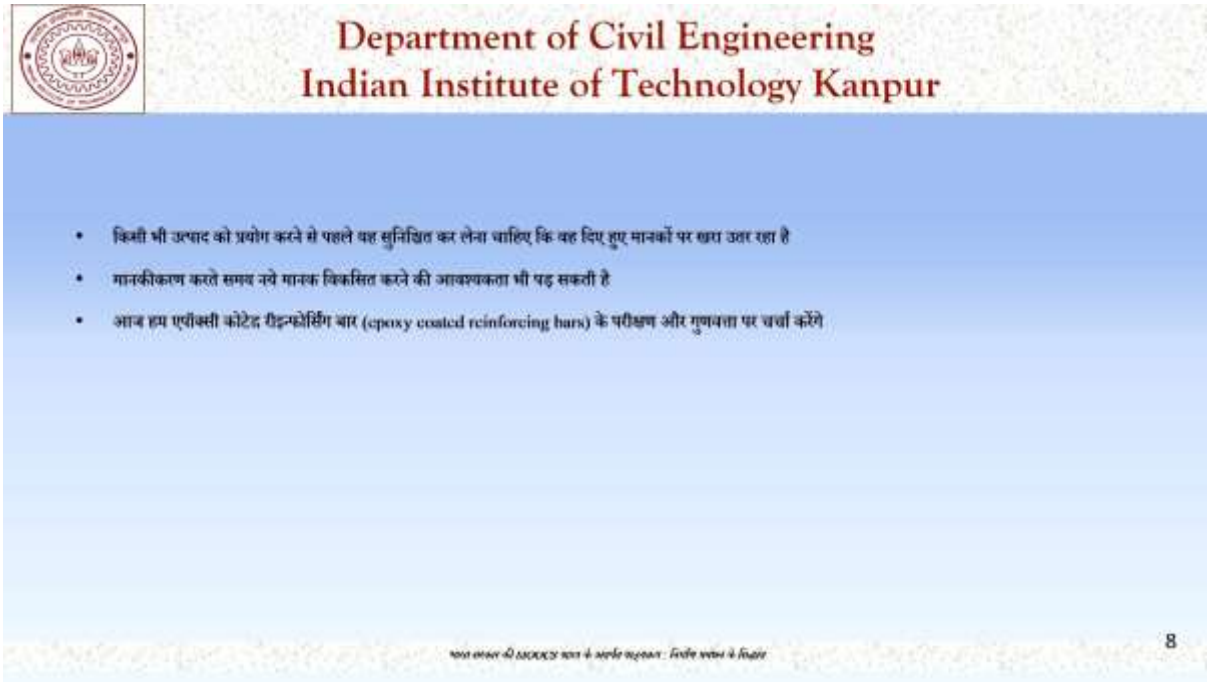
(Reference Time 01:22)



Aaj hamaaree charcha utpaad se sambandhit hai pahale to ham yah samajh len jab kaarakhaane mein arthaat factory mein koee bhee product ya utpaad banata hai aur vah hamaaree site par laaya jaata hai jahaan par ki ham usaka nirmaan kaary mein prayog karenge. To pahalee baat to yah hai ki factory se hamako ek certificate ya patr milata hai yah

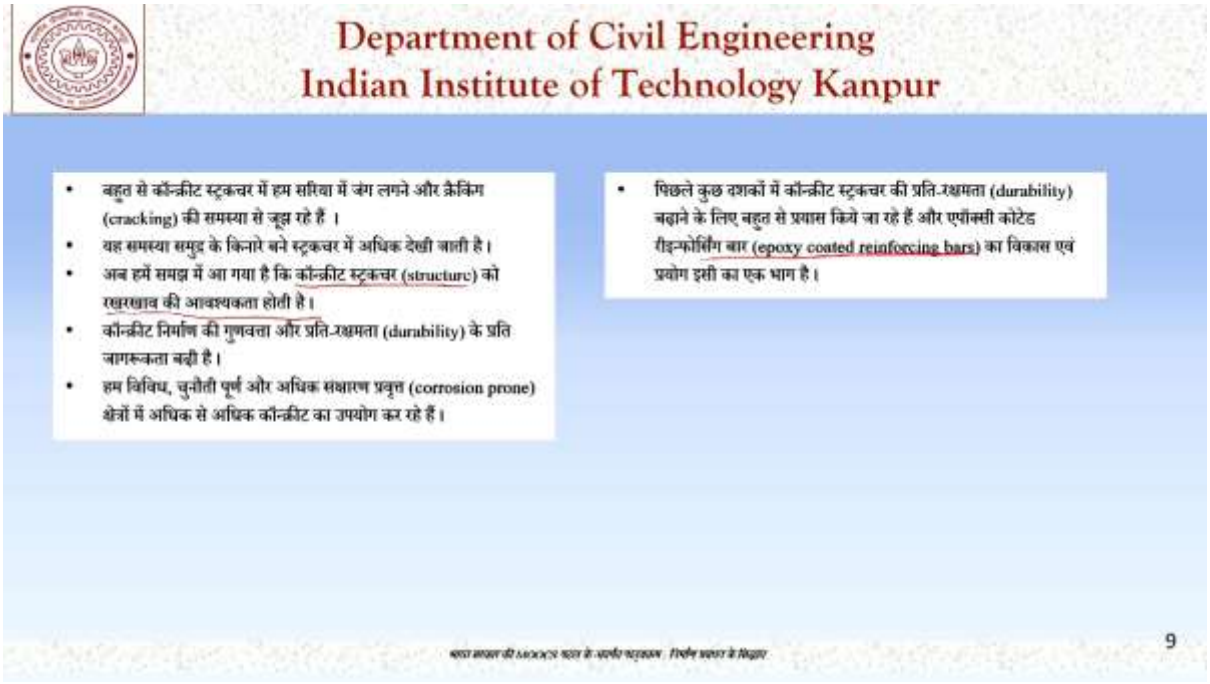
jo utpaad aapake yahaan ja raha hai yah in maanakon mein khara utara hai. Ek tareeka to yah hai ki ham us certificate ko seedhe-seedhe maan le aur site par koee bhee pareekshan na karen. Doosaree baat yah ho sakatee hai ki nahin hamane aapaka certificate maana lekin apanee santushti ke lie ham yahaan par bhee kuchh pareekshan karenge. To yah charcha in donon baaton ko dhyaan mein rakhate hue kee gaee hai. Vo baat doosaree ki jin maanakon par factory mein koee utpaad khara utara hai lagabhag unheen maanakon ka pareekshan site par bhee kiya jaata hai. Yah nahin ho sakata hai kee factory par kuchh maanakon ka pareekshan ho aur kuchh bilkul alag maanak site par test kie jaane lage. Donon hee logon ko chaahe vah site ke engineer hon ya factory ke engineer hon un logon ko yah pata hona chaahie ki aakhirakaar is utpaad se kya apekshit hai, usakee kya expected properties hain, kis prakaar se unako test kiya jaega aur unake acceptance criteria kya hain. Is baat ko dhyaan mein rakhate hue ham aage badhate hain aur apanee charcha ko aage badhaate hain.

(Reference Time 03:02)



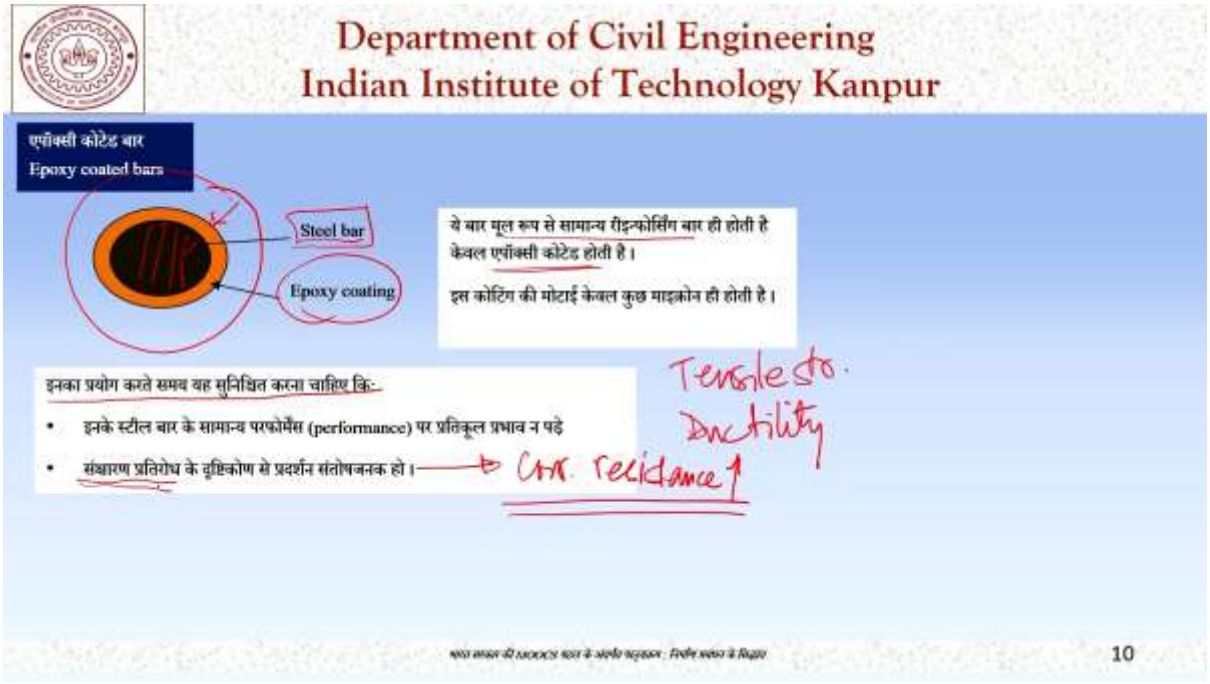
Kisee bhee utpaad ka prayog karane se pahale yah sunishchit kar lena chaahie ki vah die gae maanakon par khara utara hai. Maanakeekaran karate samay nae maanak vikasit karane kee aavashyakata bhee pad sakatee hai aur jaisa ki hamane kaha ki aaj hamaaree charcha pahale epoxy coated reinforcing bars ke pareekshan aur gunavatta par hogee.

(Reference Time 03:24)



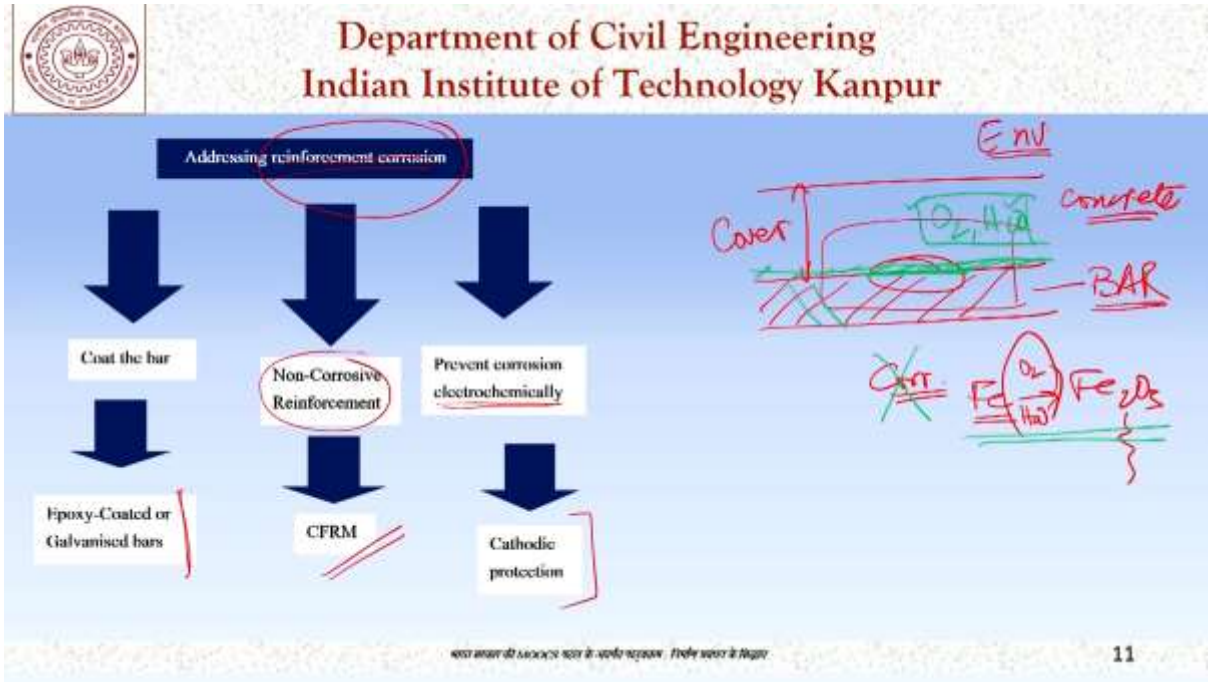
Epoxy coated bars kee charcha karane se pahale unake upayog ka background thoda samajh lena chaahie. Bahut se concrete structures mein ham dekh rahe hain hamaaree sariya mein jang lag jaatee hai, jo reinforcing bars use karate hain vah jang kha jaate hain aur cracking kee samasya utpann hotee hai. Yah samasya samudr ke kinaare bane structures mein adhik dekhee jaatee hai. Pichhale tamaam varshon ke anubhav se ham samajh gae hain ki concrete structures kisee bhee prakaar se rakharakhaav se mukt nahin hai unhen bhee rakharakhaav kee aavashyakata hotee hai English mein kahen to concrete structures ya concrete structures are not maintenance free unhen bhee maintenance kee aavashyakata hotee hai. Concrete nirmaan kee gunavatta aur pratirakshamata arthaat durability ke prati jaagarookata badhee hai jo usear hain vo yah jaan gae hain ki koee bhee structure agar samay se pahale kharaab hone ke ya service mein na rah paane ke lakshan dikhaata hai to baat chinta kee hai aur kisee na kisee ko isakee jimmedaaree lenee chaahie. Jaise-jaise nirmaan ke kshetr mein mechanization hua hai, automation hua hai ham diverse environments mein (vividh vaataavaran) mein, chunauteepoorn vaataavaran mein aur adhik corrosion prone kshetr mein concrete ke structure bana rahe hain. Isalie yah aavashyak ho jaata hai ki ham concrete mein jo sariya hai vo jang na lage isake lie yathaasambhav prayaas karen aur isee disha mein ek pahal hai epoxy coated reinforcement arthaat epoxy coated reinforcing bars ka prayog.

(Reference Time 05:11)



Epoxy coated reinforcement bars kya hotee hai? Yah chitr hai ek epoxy coated reinforcing bars ka aur epoxy coated bars bhee mool roop se saamaany reinforcing bars hotee hain keval epoxy coated hotee hain. Yah chitr scale par nahee hai lekin yah ek steel bar hai aur is par ek bahut hee patalee epoxy kee coating kar dee jaatee hai. Yah coating factory mein hotee hai aur isaliye epoxy coated bar ek factory mein nirmit utpaad hai aur isaka prayog nirmaan kaary mein site par kiya jaega. Epoxy coated bars ka prayog karate samay hamen sunishchit kar lena chaahie ki unake steel bar ke saamaany performance par koee pratikool prabhaav nahin hai arthaat epoxy coated bar se jo steel bar se performance expected hai usamen kisee prakaar kee kamee nahin aanee chaahie. Chaahe vah tensail strength ho ya daktilitee ho ya koee any propartee hee kyon na ho. Sanchaaran pratirodh ke drshtikon se pradarshan santoshajanak hona chaahie arthaat epoxy coated bars kyonki yah corrosion resistance badhaane ke lie use kee ja rahee hai to isalie jo inase expected ya apekshit performance hai corrosion resistance ke prati vah avashy meet hona chaahie. Us expectation par in bars ko khare utarana hee chaahie.

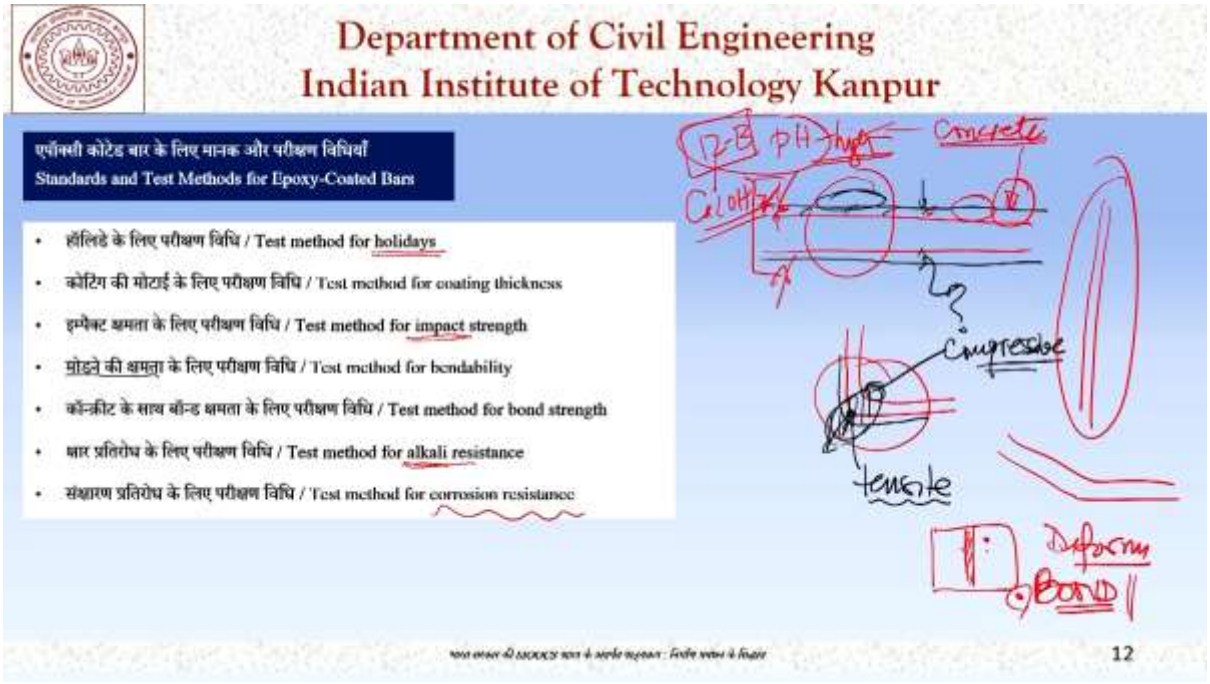
(Reference Time 07:00)



Jahaan tak ki ek badee picture ka savaal hai ham reinforcement corrosion kee samasya ko kis prakaar se deal karate hain isako samajhane ke lie hamen thoda sa gyaan hona chaahie reinforcement corrosion kya hota hai? Aasaan shabdon mein agar ham kahen to reinforcement corrosion is bar ka corrosion hai is bar mein jang lagane kee prakriya hai jo ki concrete ke andar daba dee gaee hai. Yahaan se lekar yahaan tak is distance ko cover kaha jaata hai yah hamaara vaataavaran hai. To corrosion jo hai vah is sariya ke satah par hone vaale is reaction ka naam hai jahaan par ki aayaran ya loha kisee na kisee prakaar se oxides aur hydroxides mein parivartit ho jaata hai isake lie hamen oxygen aur paanee kee aavashyakata hotee hai jo ki concrete ke andar prachur maatra mein upalabdh hota hai. Ab ham agar kisee prakaar se yahaan par koee coating kar den aur yah surface yah satah jahaan par ki yah reaction ho raha tha vo satah concrete mein upalabdh oxygen aur paanee se alag ho jae to yah corrosion nahin hoga. Epoxy coated bars ka mool siddhaant yahee hai, ham sariya ke oopar ek coating kar den taaki sariya kee satah the surfaces of the reinforcing bar, vah concrete mein oxygen aur paanee ke sampark mein na aae. Yah baat agar hamen samajh mein aa jaatee hai to ham epoxy coated bars ke pareekshan ko lekar kis tareeke ke test hone chaahie yah sab aasaanee se samajh sakate hain.

Aaiye vaapas chalate hain us bade chitr par jahaan par ki ham reinforcement corrosion kee samasya se kis prakaar deal karate hain. Ek tareeka hai coat the bar jaisa ki hamane abhee bataaya ki bar-bar ek coating laga dee jae; doosara tareeka hai ki ham aise reinforcement ko use karen jo ki jang khaaye hee nahin non corrosive reinforcement use karen ya phir electrochemical tareeke se ham corrosion current ko bahane se rok den. In teenon approaches ke udaaharan kya hai? Epoxy coated ya galvanized bar coat the bar ke antargat aate hain. Jahaan tak non-corrosive reinforcement ka savaal hai use of CFRM arthaat Continuous Fiber Reinforced Material jinamen ki lohe ka prayog hee nahin hota hai to unake corrode karane ka savaal hee nahin hai yah padaarth kyon nahin use kiya jaata hai jyaadaatar yah prashn main aapake lie chhod raha hoon ek homework ke roop mein aur jahaan tak electrochemical prevention ka savaal hai cathodic protection ityaadi is tareeke ke kuchh approaches hain kuchh tareeke hain jinase ki ham reinforcement corrosion kee samasya se deal karate hain. To aaiye ham apanee charcha aage badhaate hain epoxy coated bars par.

(Reference Time 10:15)



Epoxy coated bars ke lie kya maanak hai aur kya pareekshan vidhiyaan hain unake kuchh siddhaant ham discuss karenge. Ek test hota hai holiday ke lie pareekshan. Holiday yah ek bahut hee vishesh shabd ek bahut hee vishesh paripekshy mein epoxy coated bars mein use hota hai saamaanyat: is shabd ka arth sabhee ko pata hai chhuttee kar dena. Yahaan par holiday ka arth chhote-chhote chhidron ko kaha jaata hai unako kisee kaaran se holiday kaha jaata hai.

Coating kee motaee ke liye pareekshan jo ham coating karate hain jaisa ki hamane kaha tha ki yah hamaaree reinforcing bar hai aur isake oopar yah ek coating hai to is coating kee motaee kitanee hai, isaka pareekshan hona chaahie. Impact kshamata ke lie pareekshan hona chaahie kyonki epoxy coated bars jab factory se site par laee jaatee hain to yadyapi tarah-tarah ke precautions lie jaate hain lekin is baat se inkaar nahin kiya ja sakata ki kabhee-kabhee in bars ke oopar koee bhaaree vajan aakar girega reinforces concrete structures mein plus hone ke baad bhee jo andar vibrator hota hai usase bhee yah sariya takara sakatee hai yah dekhana hoga ki is prakaar ke impact se yah jo coating hai vah damaged to nahin hotee is baat ko check karane ke lie impact kshamata ka pareekshan kiya jaata hai.

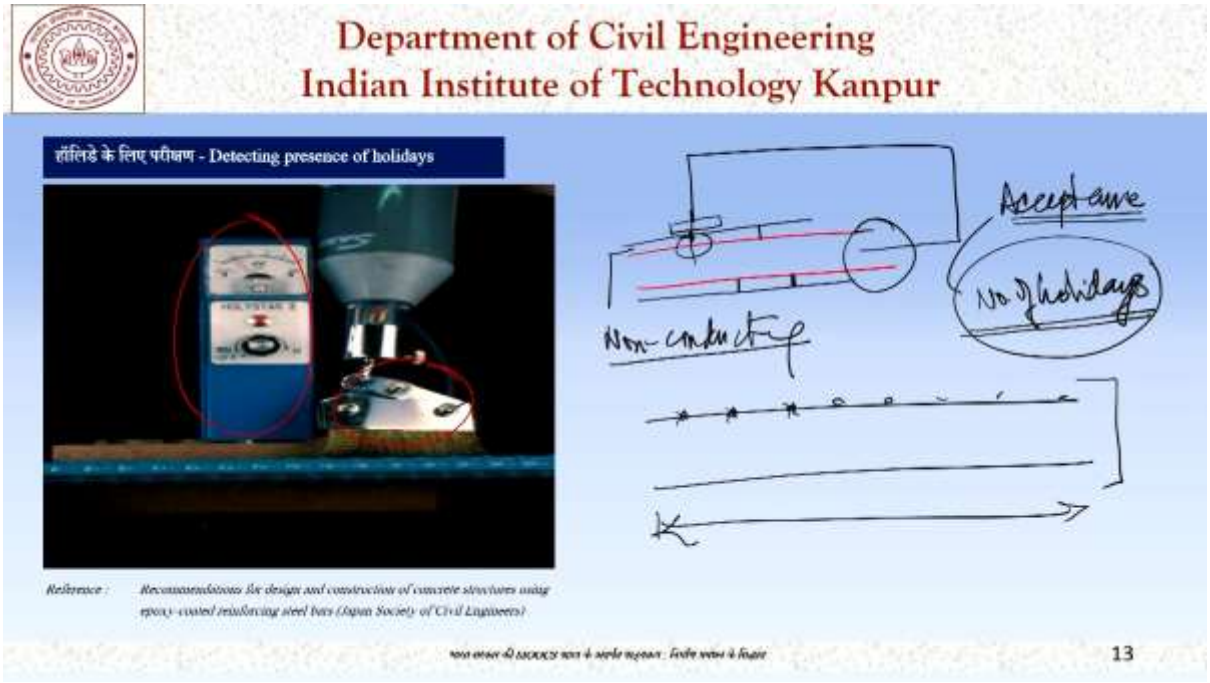
Modane kee kshamata ke lie pareekshan. Epoxy coated bars saamaany bar kee tarah hee jab ham normal reinforces concrete structures mein prayog karate hain to hamen unako modana pad sakata hai. Koee jarooree nahin hai ki sab bar seedhe-seedhe hee lagaee jae, kabhee 90 degree bend hota hai kaheen par 45 degree bend hota hai ityaadi. To jab ham is bar ko is prakaar modate hain to hota kya hai ki yahaan par jo coating hai vah coating bhee isee prakaar se mudegee. Ab is kshetr mein sariya ke baaharee taraph coating mein tensile stasis develop honge aur is taraph compressive code stesis develop honge . To yah dekhana hai ki hamaaree coating yahaan par tensile stasis ke aa jaane se kaheen toot to nahin jaatee hai ya itanee patalee to nahin ho jaatee hai ki vo effective na rahe is baat ko ham check karate hain modane kee kshamata se.

Concrete ke saath bond kshamata ke lie pareekshan. Jab ham sariya concrete ke andar daalate hain yah apekshit hai ki concrete aur sariya ek hee saath deform karenge arthaat inamen kisee prakaar kee non compatibility nahin hogee. To isake lie yah aavashyak hai ki sariya aur concrete mein bond avashy ho. Agar bond nahin hota hai to usake lie design mein phir doosaree tareeke se design hotee hai. Normal reinforces concrete structures mein bond hona bahut hee aavashyak hai yah tay baat hai ki agar ham yahaan par koee coating kar dete hain

to yah chinta ho sakatee hai ki kya isakee bond performance bina coating ke jo hamaaree sariya hai, saamaany sariya hai usase compromised to nahin hogee. To isalie yah aavashyak hai ki ham sunishchit karen kee coating kar dene maatr se bond strength par pratikool prabhaav nahin pada hai. Kshaar pratirodh ke lie pareekshan karana aavashyak hai alkali resistance yah coating sariya ke saath concrete mein daba dee jaatee hai concrete ke andar ka vaataavaran bahut hee alkalane hota hai usaka ph bahut hee high hota hai. Ho sakata hai 12 ho 13 ho, yah kyon hota hai? Kyonki vahaan par bahut saara calcium hydroxide cement ke hydration se released hota hai. Yah sunishchit karana atyant aavashyak hai ki itane high ph vaataavaran mein hamaaree jo coating hai vah stable ho, vah ditiriet na kar jae yah sunishchit karane ka e lie ham alkali resistance ka test karate hain.

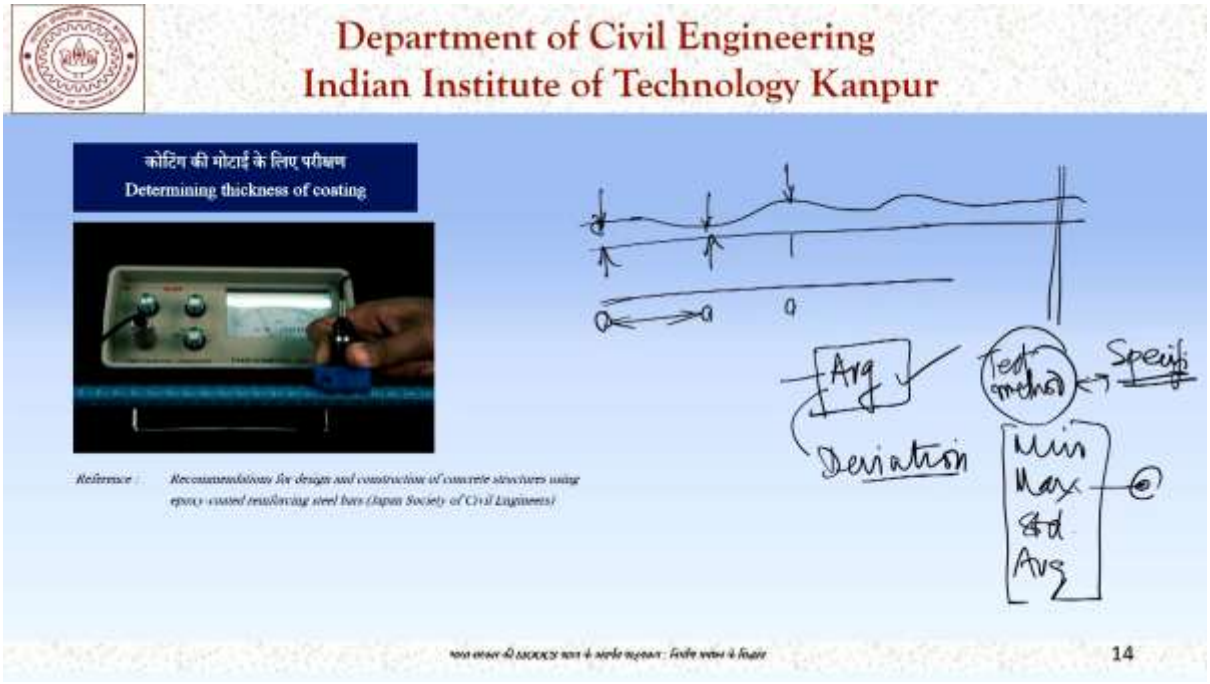
Aur antat: kyonki hamaara mool uddeshy corrosion resistance ko badhaana hai isaliye ham koshish karate hain ki ham is epoxy coated bar se corrosion resistance ko bhee check karen. Yah kuchh test hain jinake ki aadhaar par ham epoxy coated bars ka moolyaankan karate hain. To aaiye ek-ek karake kuchh chitron ke maadhyam se in test ke bare mein kuchh adhik jaanakaaree haasil karen.

(Reference Time 15:44)



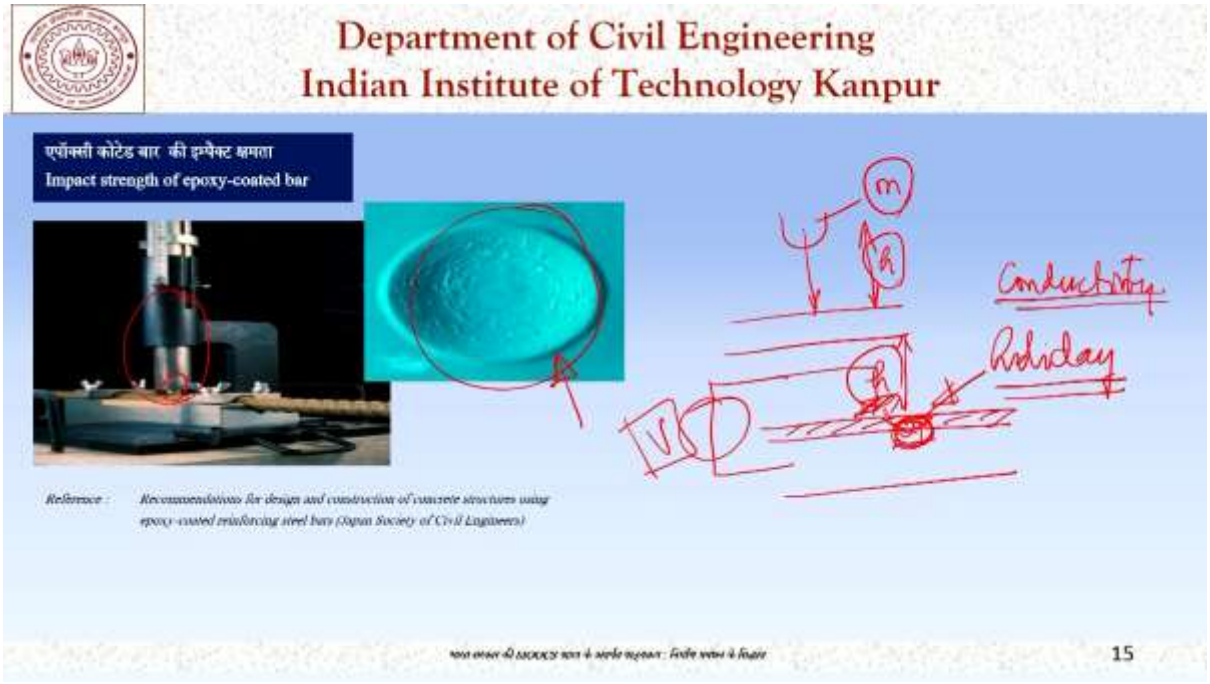
Yah chitr hai holiday ke pareekshan ka. Isaka siddhaant kya hai? Yahaan par ek hand held meter hai aur yah ek tareek se electrode hai kiya kya jaata hai ki is bar par ek coating hai aur isamen holiday ya kisee prakaar chhidr hone kee avastha mein ham agar electric circuit rakhate hain jo ki ek taraph hamaaree sariya se juda hua hai aur doosara yahaan par dikhaaye gaye brash se agar yahaan par koee chhidr hota hai to vah electric circuit poora ho jaayega aur agar chhidr nahee hai to is coating ke non-conducting hone kee vajah se yah sarkit poora nahee maana jaayega. To test is baat ka hai ki is lambaee mein kitane chhidr paaye jaate hain aur unako kis prakaar se test kiya jaana chaahiye. Yah maanak mein likha hota hai to aap ek bar leejiye aur usamen har 5 cm par, har 10 cm par yah pareekshan keejiye aur yah report keejie ki number of holiday's kitane the aur un number of holiday's kee ek critical value hogee jo ki paribhaashit karegee acceptance ko ki haan yah sariya acceptable hai aur yah sariya acceptable nahee hai, yah to baat huee holiday's ke reduction kee.

(Reference Time 17:17)



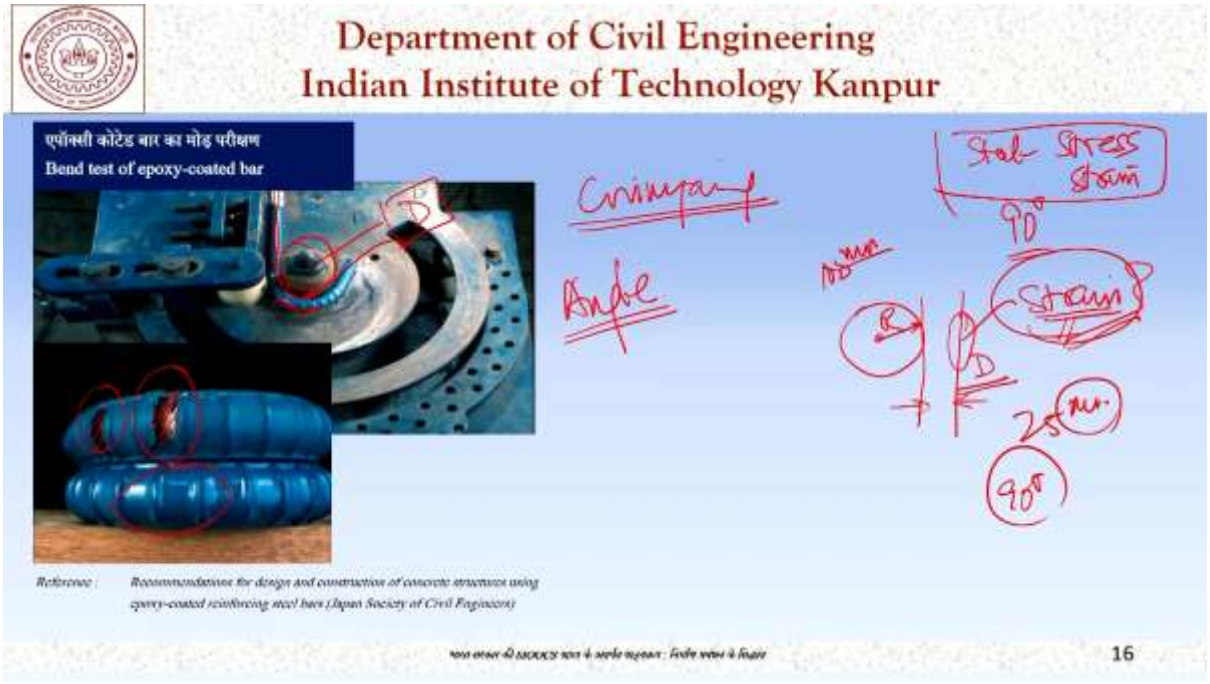
Yah test dikhaata hai thickness (hard coating kee motaee). Yahaan par bhee holiday's ke prakaar hee yah pata karane kee koshish kee jaatee hai ki yah jo coating hai vo is prakaar se undulating to nahee kar rahee hai arthaat yahaan par kuchh motaee ho, yahaan par kuchh aur motaee ho yahaan par kuchh jyaada ho ityaadi to isake liye bhee maanakon ke aadhaar ek distance lekar ke vahaan par yah coating kee motaee measure karana aur usako report karana. Isamen do baate hain ek to ham average value report karen jisase ki hamen pata chalega ki haan is sariya mein ausatan coating kee motaee itanee hai. Doosaree cheej hai ki ham usamen deviation bhee report karen ki haan hamane itanee lambaee kee sariya lee usamen hamen minimum value ye milee, maximum value ye milee, isaka standard deviation ye tha, average ye tha. To kisee bhee pareekshan mein hamesha kuchh statistical data generat hota hai vo report kiya jaata hai, vah data acceptable hai ya nahee vah specification ka maamala hai. To yahaan par hamesha kee tarah ek test method aur specification yah do cheejen bhinn hotee hain. Yah hamesha dhyaan mein rakhana chaahiye ki jab bhee ham koee test karate hain to ham factors arthaat chaahe vo number of holiday hon, chaahe vo coating thickness hon aur chaahe koee bhee parameters hon usakee vailuse report karen aur un vailuse ke aadhaar par ek judgment kiya jaaye jo ki acceptance aur non-acceptance ka hoga.

(Reference Time 19:06)



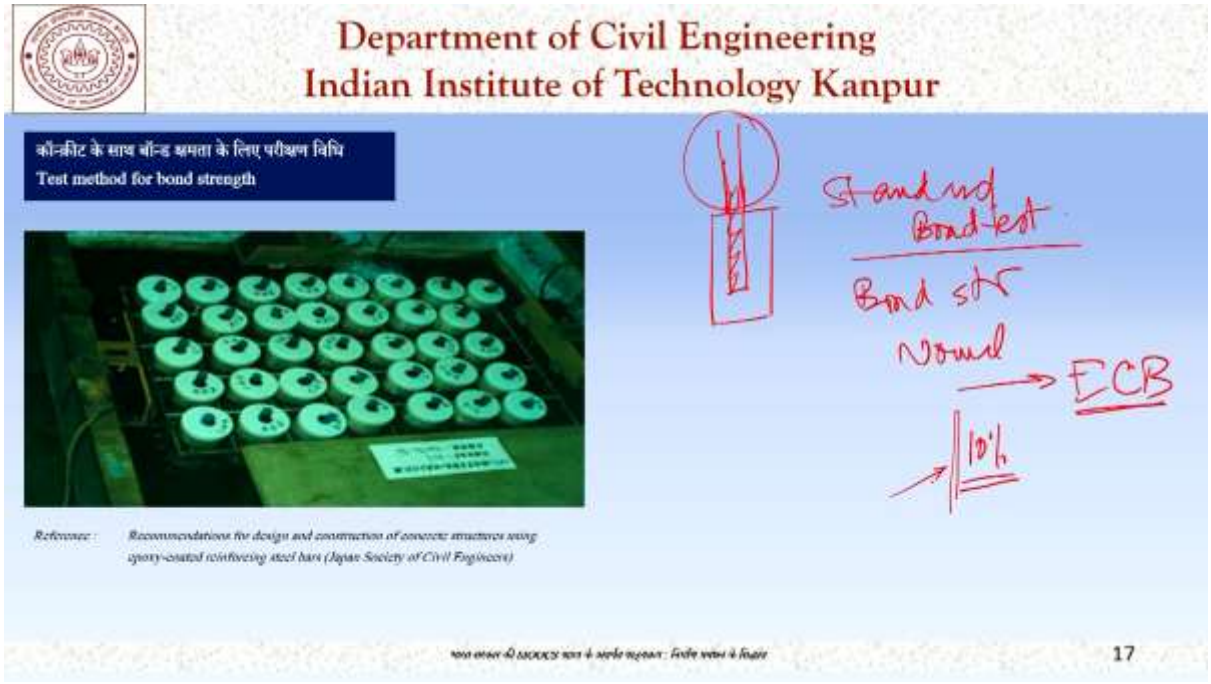
Agala test ham karate hain impact resistance. Impact resistance tay karane ke liye yah ek vishesh roop se design kiya gaya instrument hota hai. Isamen yahaan par jo tap hai vo sariya se ek oonchaee tak uthaayaat jaata hai aur usako is par girane diya jaata hai isaka mass fixed hota hai maanakon mein diya hua hai aur jis oonchaee se giraaya jaata hai vah dheere-dheere badhaee jaatee hai jab yah mass coated sariya par girata hai to spasht hai is prakaar se sariya kee coating mein deformation hogee. Jab ye deformation hotee hai to ho sakata hai yah sariya yahaan par exposed ho jaaye arthaat yahaan par coating kee motaee ek acceptable level se kam ho jaaye yadi aisa hota hai to vaapas ham holiday ditecter mode mein chale jaate hain aur yahaan par tay karate hain ki kya is mass ko is hight se giraane se yahaan par jo damage hua vah hamen acceptable hai jis prakaar se hamane holidays nikaale the usee prakaar se yahaan par ek electrode lekar ke dekhate hain ki kya conductivity to nahee establish huee aur conductivity establish karane ke liye yahaan par jo voltage ham use kar rahe hain vah bahut mahatvapoorn ho jaatee hai. Iseeliye in sab prakriyaon ka in sab testing parameters ka maanakeekaran bahut hee aavashyak hai. Is prakaar ham test karate hain epoxy coating bars ka.

(Reference Time 20:45)



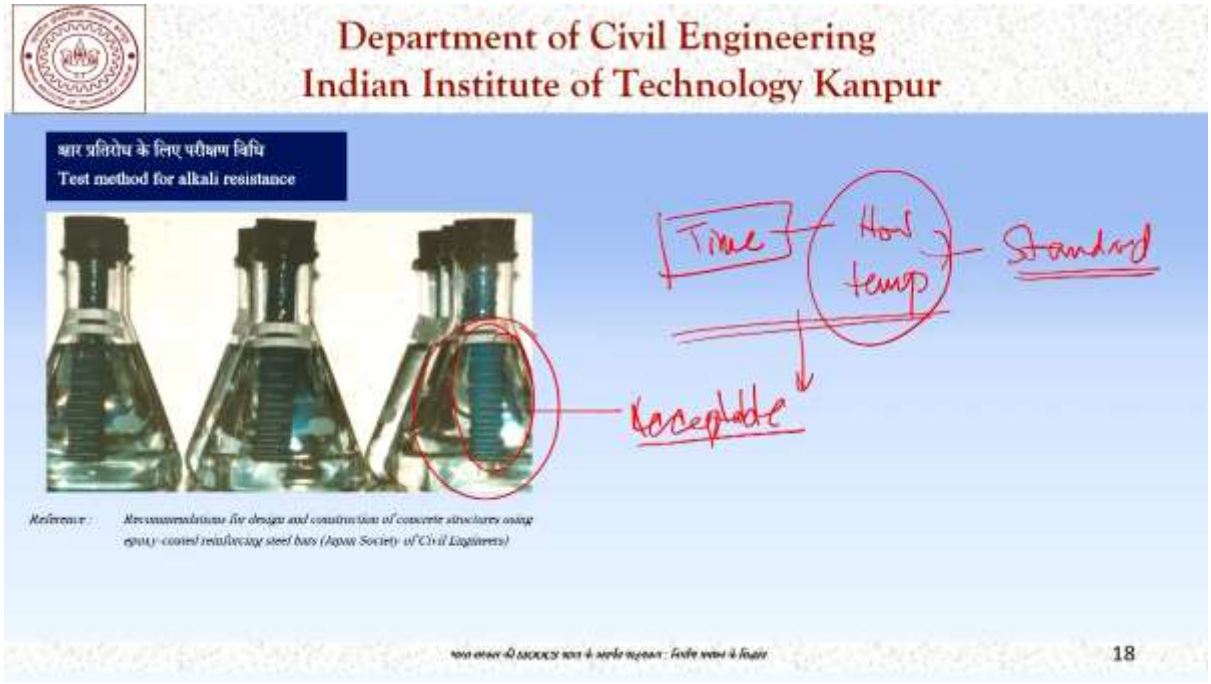
Impact resistance, yah test hai bending, epoxy coating bars ko modane par kya behaviour hota hai usaka pareekshan. Yahaan par ek seedhee bar ko is phalakram ke around bend kiya ja raha hai jaisa ki maine aapako bataaya tha agar coating is prakaar se hai baahar kee taraph toot jaatee hai to yah bar acceptable nahee hogee. Is sariya mein is prakaar ka koee damages dekhane ko nahee mil raha hai yah to huee tension side kee bar jahaan par ki is prakaar se coating tootegee. Compression side par crimping ho sakatee hai aur usako bhee hamen dekhana chaahiye ki ek acceptable level se adhik crimping na dikhaee de rahee ho. Ab modane ke test mein jo maanak honge vo ye bataayenge ki is phalakram ka diameter kitana hona chaahiye, kis angel tak bend karane kee aavashyakata hotee hai. Main aapako ek homework dena chaahata hoon ki is phalakarm ka diameter, radius badal deejiye aur isake around bend kee jaane vaalee sariya ka diameter leejiye aur agar 90 degree se ham is sariya ko bend karate hain to baahar kitana stren aata hai isakee roughly calculation karane kee koshish keejie. Aap radius le leejie yahaan par 100 mm, yahaan par 25 mm kee bar le leejiye aur 90 degree bend karake dekhiye ki baahar kitana stren aata hai isaka moolyaankan karane ke liye kuchh assumption karane honge aur vo jab aap svamy karane baithenge tab aapako samajh mein aa jaayega koee bhee assumption leejiye, stren gyaat karane kee koshish keejiye. Jab aap stren gyaat kar lenge tab doosara prashn hoga ki is stren kee value ka kya mahatv hai aur jo steel ka stress stren diagram hota hai, us diagram mein yah value kahaan baithatee hai aur is baat ka hamaaree pooree design philosophy mein kya mahatv hota hai? Ye charcha thodee alag hai ham vaapas chalate hain epoxy coated bars kee charcha par aur agala chitr dekhate hain bond strength ka.

(Reference Time 23:13)



To yahaan par dikhaaye gaye hain kuchh specimen jisamen ki concrete mein ek epoxy coated bar embedded hai. Yah specimen bond ke nahee hain kyonki bond ke agar hote to jo yah baahar nikala hua bhaag hai yah thoda lamba hona chaahiye. To is avastha mein jaise ki standard bond test kiya jaata hai usee prakaar ka bond test epoxy coated bars se bhee karate hain aur yah sunishchit karate hain ki jo bond strength hamako normal sariya mein milee vahee hamako epoxy coated bars mein bhee milee. Agar aisa hota hai ya ek acceptable level ka deterioration hota hai ham kahate hain ki theek hai epoxy coated bars mein agar bond strength 10% kam hai to hamaare liye maany hai, agar vo 10% se adhik kam ho jaatee hai tab epoxy coated bars maany nahee hogee. To is prakaar se maanako ke aadhaar par hee nirnay hoga.

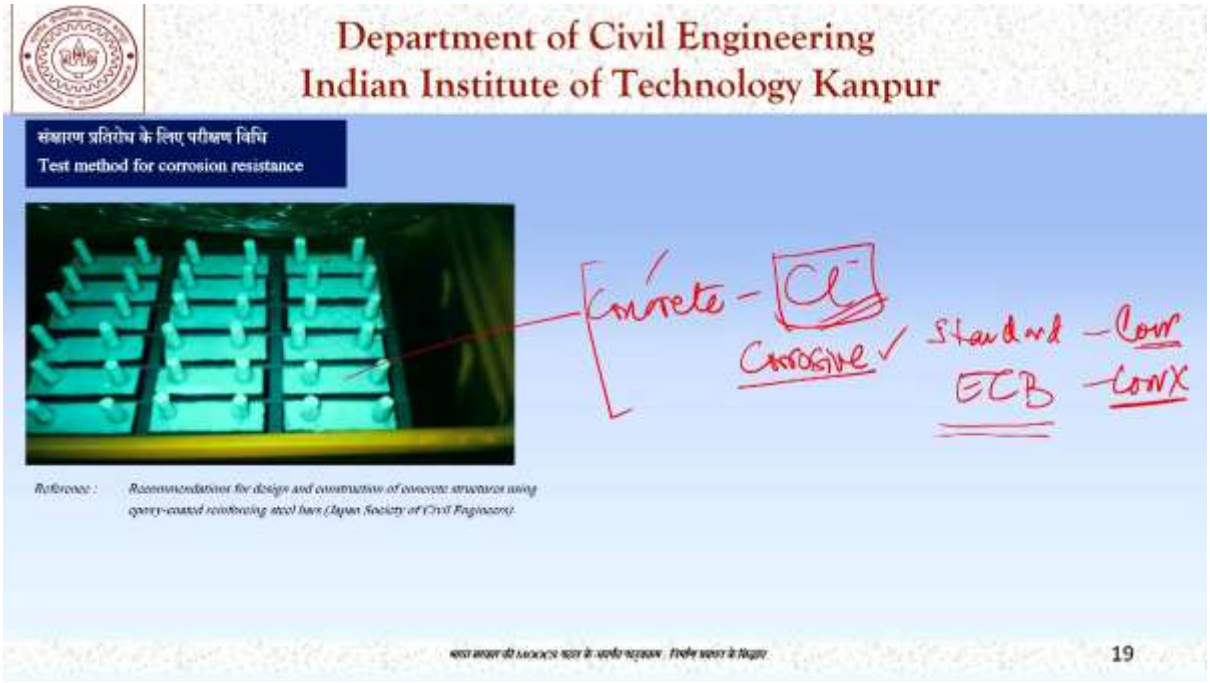
(Reference Time 24:20)



Agala test hai alkali resistance ka (kshaar pratirodh) ka aur vah test bahut hee simple hota hai. Kisee bhee chemical environment mein chaahe vo high ph ho, haee chloride ho isamen ham epoxy coated sariya ko kuchh samay ke liye rakhate hain aur vo samay kitana hona chaahiye,

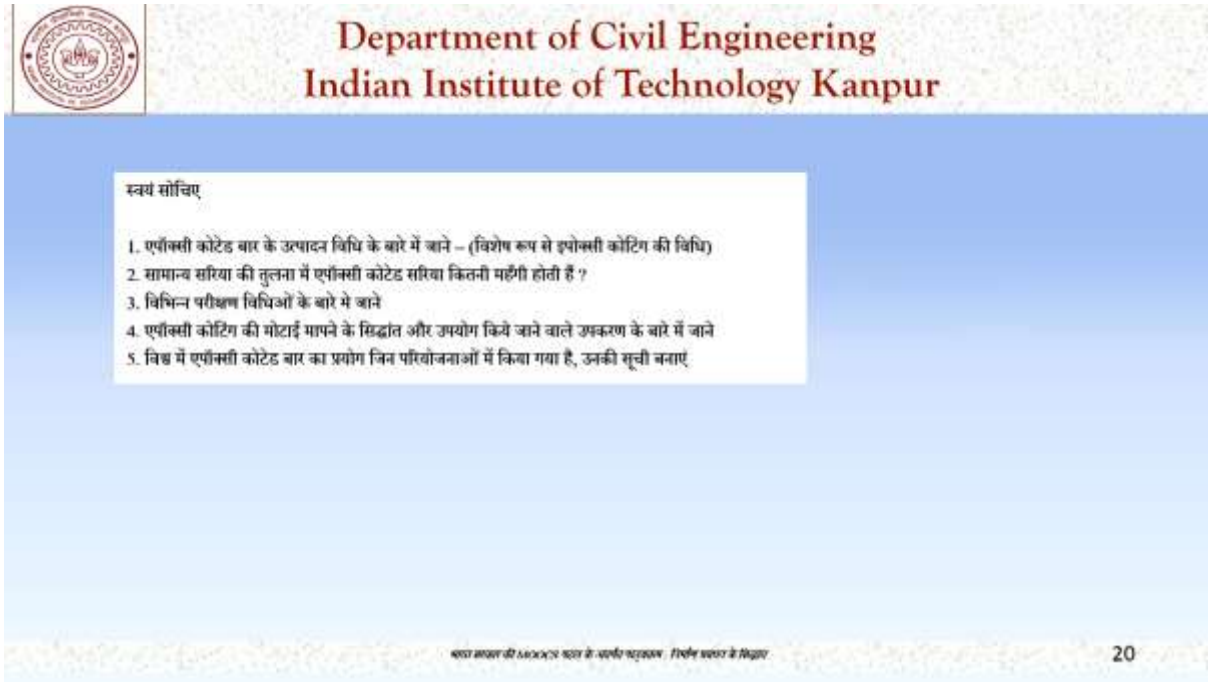
kya temperature chaahiye yah baaten phir standards kee aa jaatee hain. Us standard ke aadhaar par kiye gaye test ke baad hamaaree jo sariya hai kya vo hamen acceptable hai agar vo hamen acceptable hai to haan yah sariya alkali resistance ya chemical resistance jo hamen apekshit hai us maanak par kharee utaratee hai.

(Reference Time 25:04)



Yah test hai epoxy coated bars ke corrosion resistance ka concrete mein embedded hote hue. Karate kya hain ki is concrete mein ham pahale se hee solt arthaat chlorides mila dete hain, kitane chlorides milaayenge maanak mein likha hua hai aur us corrosive environment mein yah maanakar chal rahe hain ki chlorides ke concrete mein hone se atmosphere jo bars ke around atmosphere hai usake aas paas jo vaataavaran hai vo corrosive ho gaya hai aur jahaan par ki normal bars jo hamaaree standard bars hain vo corrode kar jaayengee hamaaree epoxy coated bars ko corrode nahee karanee chaahiye yah pradarshan is tareeke ke test se kiya jaata hai. Yahaan par bhee har parameters maanakon mein diya hota hai ki kis prakaar kee concrete ka prayog hoga, kitanee chloride rakhee jaayegee, kitane din ke liye ye test kiya jaayega us dauraan kis vaataavaran mein ye specimen rakhe jaayenge ityaadi. To in sab baaton ke aadhaar par ham tay karate hain epoxy coated bars kee corrosion resistance ya sankshaaran pratirodh kee kshamata kitanee hai. To ye the kuchh test jinakee ek list lecture ke shuroo mein dikhaee gayee thee aur unake siddhaanton par hamane charcha kee.

(Reference Time 26:24)



Epoxy coated bars par charcha samaapt karane se pahale yah kuchh prashn hain jo ki main aapake liye homework ke roop mein chhod dena chaahata hoon. Epoxy coated bars ke utpaadan vidhi ke bare mein jaane vishesh roop se epoxy coating kee vidhi. Saamaany sariya ko lekar usamen epoxy coating kis prakaar kee jaatee hai. Doosara prashn hai saamaany sariya kee tulana mein epoxy coated sariya kitanee mahangee hotee hai. Teesara prashn hai vibhinn pareekshan vidhiyon ke bare mein jaane. Hamane keval siddhaanton kee baat kee hai, jo mechanism involved hai usakee charcha kee hai, usake jo details hain chaahe vo concrete ke bare mein ho, chaahe vo voltage ke bare mein ho in sabake bare mein maanako mein likha hua hai aur un maanako ka aap adhyayan kar sakate hain. Epoxy coating kee motaee maapane ke siddhaant aur upayog kiye jaane vaale upakaran ke bare mein jaane. Aur ant mein vishv mein epoxy coated bars ka prayog kiye jaane vaalee pariyojanaon kee ek soochee banaayen. To ye charcha rahee epoxy coated bars kee to isake saath aaj ka lecture samaapt hota hai.

(Reference Time 27:32)

Aur yahaan par hamesha kee tarah kuchh upayogee prakaashan evan websites kee list dee huee hai jo ki aapako yah material mein sahaayak honge.

Dhanyavaad! Namaskaar.