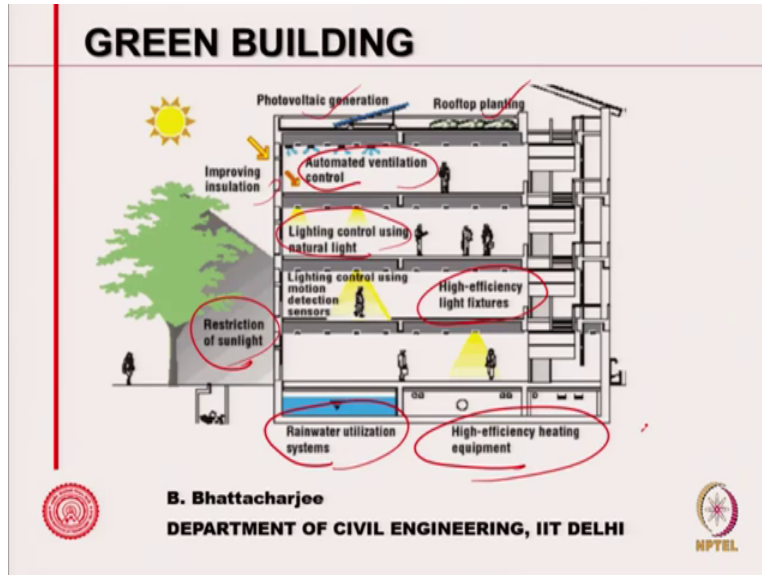


Sustainable Materials and Green Buildings
Professor B. Bhattacharjee
Department of Civil Engineering
Indian Institute of Technology Delhi
Lecture 44
Green Building Rating Systems

(Refer Slide Time: 0:19)



We have already talked about green building and if you see the features rain water utilisation features if you see the features of this ones, start from the bottom, high efficiency heating cooling system, high efficiency lighting fixtures, even using tree you might restriction of direct sunlight, improved insulation, photovoltaic generation, even roof planting, automated ventilation control intelligent system, right and efficient lighting and natural light as well and so on. So, all the features that we talked about so far they would go into green building scenario.

(Refer Slide Time: 1:09)



So, LEED is actually started in USA leadership in energy and environment design.

(Refer Slide Time: 1:16)



There are similar parallels it is a rating system, it is essential rating system and you will see that knowledge base is very limited it is actually lot of information. So, there are several of them worldwide.

(Refer Slide Time: 1:32)



For example, this I have defined leadership in energy and environment design.

(Refer Slide Time: 1:35)



Now, green building council of Australia GBCA has developed a green building standard known as green star. So, LEED is one of them which started in US, green star is in Australia. In china, there are two sets of national building energy standards, one for public building, another for residential.

(Refer Slide Time: 2:00)

GREEN GLOBE EMERGES TO CHALLENGE LEED

- **THE GREEN GLOBE ENVIRONMENTAL – ASSESSMENT AND RATING SYSTEM REPRESENTS MORE THAN A DECADE OF RESEARCH AND REFINEMENT BY A WIDE RANGE OF PROMINENT INTERNATIONAL ORGANISATIONS AND EXPERTS.**
- **DURING 2002 GREEN GLOBES FOR EXISTING BUILDINGS WENT ONLINE IN THE UNITED KINGDOM AS THE GLOBAL ENVIRONMENTAL METHOD (GEM), AND EFFORTS BEGAN TO INCORPORATE BREEAM GREEN LEAF FOR THE DESIGN OF NEW BUILDINGS INTO THE ONLINE GREEN GLOBES FOR NEW BUILDINGS.**



GREEN BUILDINGS


- **THE GREEN BUILDING COUNCIL OF AUSTRALIA (GBCA) HAS DEVELOPED A GREEN BUILDING STANDARD KNOWN AS GREEN STAR.**
- **IN CHINA, THERE ARE TWO SETS OF NATIONAL BUILDING ENERGY STANDARDS, ONE FOR PUBLIC BUILDINGS AND ANOTHER FOR RESIDENTIAL BUILDINGS.**



Green globe environmental assessment and rating system represents more than one decade of research and refinement of wide range of prominent international and organisations experts, etc, etc. During 2002 green globe you know for existing buildings went online in United Kingdom. So, if you look at United Kingdom then this is green globe. So, Australia green star in UK green globe, right. As a global environmental method they call it GEM global environmental method. And efforts begin to incorporate BREEAM green leaf this is green leaf for the design of new buildings into online green globes of new buildings. So, in UK they use this is called BREEAM which is general global environmental method.

(Refer Slide Time: 3:02)

- **THE GREEN GLOBES SYSTEM HAS ALSO BEEN USED BY THE CONTINENTAL ASSOCIATION FOR BUILDING AUTOMATION (CABA) TO POWER A BUILDING INTELLIGENCE TOOL CALLED BUILDING INTELLIGENCE QUOTIENT (BIQ).**




And also being used by continental association of building automation. So, this is being used by other people too, to power a building intelligence tool called building intelligence quotient BIQ. So, there are several systems right.

(Refer Slide Time: 3:22)

GREEN GLOBES ,AN ALTERNATIVE TO LEED

- **GREEN GLOBES RATING SYSTEM PROVIDES AN ASSESSMENT TOOL FOR CHARACTERIZING A BUILDING'S ENERGY EFFICIENCY AND ENVIRONMENTAL PERFORMANCE.**
- **THE SYSTEM ALSO PROVIDES GUIDANCE FOR GREEN BUILDING DESIGN, OPERATION AND MANAGEMENT.**



Green globes an alternative to LEED actually that is in UK. It also is a rating system, provides assessment tool for characterizing a building energy efficiency and environmental performance. So, essentially you can compare buildings and they give you know LEED gives rating. System also provides building for green building design operation and management.

(Refer Slide Time: 3:48)

Program	Oversight Body	Country
LEED	US Green Bldg. Council	US, Canada
Green Globes	Green Globes , GBI, GEM	US, Canada, UK
Green Building Guidelines	Nat. Association of Home Builders	US
BREEAM	Building Research Establishment	UK
Green Star	Green Building Council of New Zealand; GBC of Australia	Australia, New Zealand
CASBEE	Japan Sustainable Building Consortium	Japan
SBTool07	International Initiative for a Sustainable Built Environment (iSBE)	Worldwide
TERI-GRIHA	The Energy Research Institute	India

28 May 2010



So, if you look at it several of these one LEED US green building council. This is what has actually developed this and generally used in US and Canada. Green globes you know GBI, GEM, etc US, Canada, UK main region. Green building guidelines, national association of home builders US. In US you have more than that, but this seems to have some or other has become very popular.

BREEAM is building research establishment UK. They have a rating system and green star is a green building council of New Zealand and green building council of Australia. So, Australia, New Zealand uses green star. CASBEE is Japan sustainable building consortium Japan. STB you know SBTool07 international initiative for a sustainable built environment this can be used worldwide. And in India they have TERI-GRIHA the Tata energy research institute that is in India.

So, there must be some more also. So, you can see there are lot of rating systems actually developed which allows for comparison of one building from another in terms of their greenness. If I may say so the strategies that we discussed a little bit earlier. So, let us take an example of LEED and that will give, let us take a simple it is not very big, essentially if you have something, some features may built in you get a point, you get a rating point and higher the rating point better the building is so they classify (0)(5:30). So, anyone of this rating system they work like this.

In fact they were supposed to be have been developed based on expert's view, but you know experts are supposed to give their opinion and then they are collated like (())(5:51) has been trying to do something recently for existing building and they say they are using, you know those who are from construction management analytical hierarchy procedure. In fact it can be, it is actually when subjective things are there so even one can use tools like Fuzzy mathematics and then analytical Fuzzy analytical hierarchy process to arrive at those rates.

(Refer Slide Time: 6:19)

HOW LEED WORKS

- **THE LEED SYSTEM IS BASED ON AWARDING POINTS RELATIVE TO PERFORMANCE.**
- **DESIGNERS CAN SELECT THE POINTS THAT ARE MOST APPROPRIATE TO THEIR PROJECTS TO ACHIEVE A LEED RATING.**
- **A TOTAL OF 100+10 POINTS IS POSSIBLE.**
- **DEPENDING UPON THE POINTS , PLATINUM ,GOLD ,SILVER,OR CERTIFIED RATINGS ARE AWARDED.**

NPTEL

But I have not been able to find out how these rates have been actually arrived at so but this rating as I said it is been given by the experts. So, awarding points relative to performance. Designer can select the points that are most appropriate to their project and achieve a LEED rating. This is the procedure followed by enlarge by everybody. Total of 100 plus 10 points is possible. Depending upon the points you either get a platinum rating that is the best. Gold rating, silver rating or just certified, right. So these are the kind of ratings given. So, you know somebody can be proud of it my building is platinum rated building, but nothing more than that really because you do not get any physical benefit at the moment. Because you have a platinum rated building nobody gives you any kind of tax relief or something of that kind. But, if you are saving your own energy that is obviously very good, right. From that point of view so that is what it is.

(Refer Slide Time: 7:28)

**LEED MINIMUM PROGRAM
REQUIREMENTS(MPRs)**

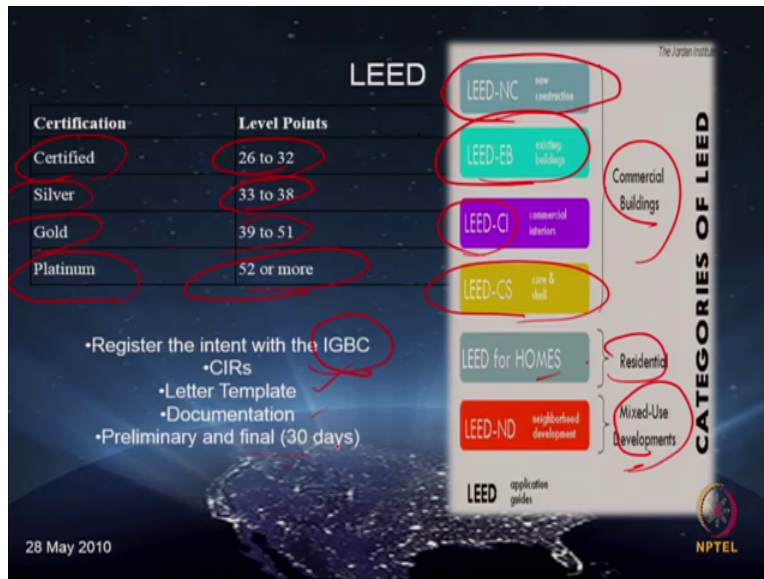
- **TOTAL COMPLIANCE IS MANDATED.**
- **PROJECT MUST CONSIST OF A COMPLETE, PERMANENT BUILDING OR SPACE ON ALREADY EXISTING LAND.**
- **THE PROJECT MUST BE EXECUTED WITHIN A REASONABLE SITE BOUNDARY.**
- **PROJECT MUST COMPLY WITH MINIMUM FLOOR AREA REQUIREMENTS.**
- **PROJECT MUST COMPLY WITH MINIMUM FTE.**
- **PROJECT OWNERS MUST CONSENT TO SHARE ENERGY WITH USGBC/GBCI.**
- **GROSS FLOOR AREA MUST CONFIRM TO MINIMUM BUILDING AREA TO SITE-AREA RATIO.**
- **REGISTRATION AND CERTIFICATION ACTIVITY MUST COMPLY WITH REASONABLE TIMETABLES.**



So, that is something minimum requirement. This must be totally complied with, total compliance is mandated that means the minimum requirement must be you know minimum requirement must be satisfied, right otherwise it will not be considered. So, to consider this you need minimum requirement. So, project must consist of a complete permanent building or space on already existing land obviously this is the first requirement. Must be executed within a reasonable side boundary these are obviously mandatory. Minimum floor area requirements and you know must comply with floor area you know some kind of minimum floor area floor to space ratio or something of that kind.

Must consent to share energy with minimum, owners must be consent to share energy with US green building council or green building council of now India because LEED has been adopted by GB you know in green building council of India. As far as India is concerned it must energy must be, energy should be as per their must share the energy usage with this organisations. Gross floor area must confirm to minimum building area to site area ratio, right. FAR etc etc must satisfy to those. And registration and certification activity must comply with reasonable timetables of course. So, you give a time frame.

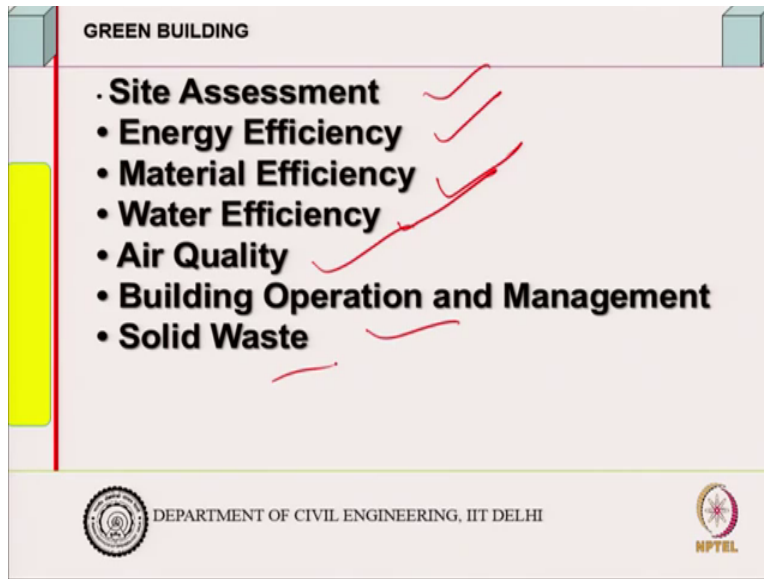
(Refer Slide Time: 9:26)



So, then you get points. Points difference counts. For example, it is certified it is certified I will come to that how you arrived at this point. If you get 26 to 32 points, 52 or more in account of 69 points here as you can shall see, percentage wise right it can be of course you can find out 52 or more then it is platinum rated. Gold 39 to 51 and silver 33 to 38, right. For different types of buildings also occupancy (10:07) also they are mixed use development, LEED for homes that is only for residential. There are (10:15) ones, so far commercial building, for example, these are commercial interiors. So you can get for the homes you can get, for mixed use development you can get and you can get for new constructions.

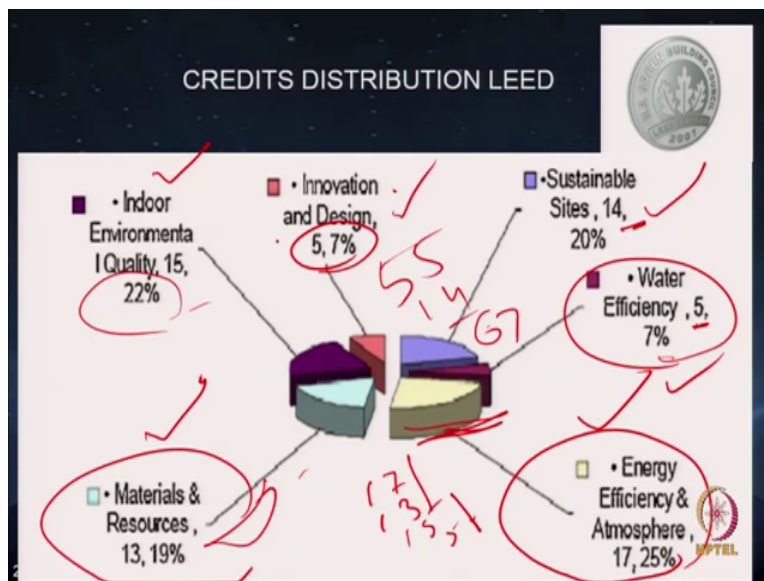
You can get for existing buildings so they have all. So, this certification you can get for all, right even for the part of building itself. For example this is for interior, something for interiors, something for core and shell, and so on. So, that is what it is. Now, Indian green building council is the one which deals with this, okay. So, you have to have a letter, documentation, etc preliminary and final within 30 days. So, time frame is also mentioned, right. So, something like that should be there.

(Refer Slide Time: 11:07)



Site assessment, energy efficiency these are the features on which it is actually decided. Material efficiency, water efficiency, air quality, building operation and management and solid waste. So, these are the features, right. On each of them you get certain points.

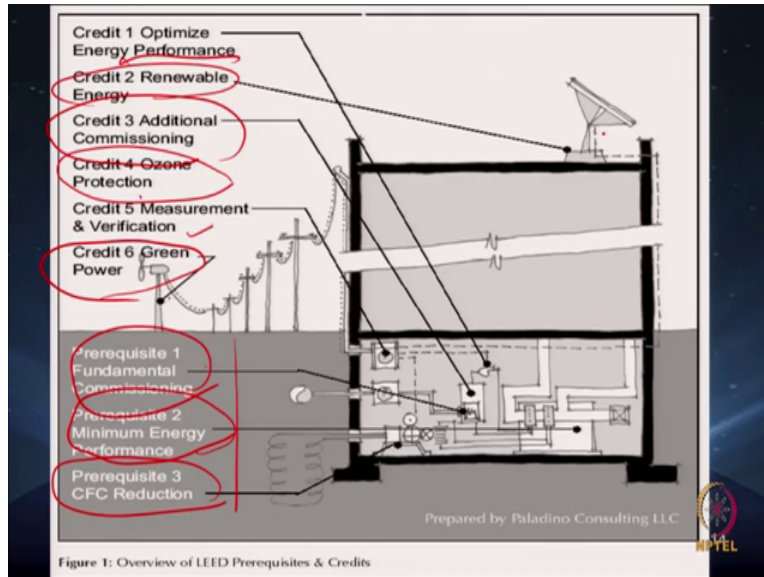
(Refer Slide Time: 11:24)



For example, okay let me see which is the highest. This is 17 out of 69 around 69. So, it is around 25 percent is energy major share. Then material and resources is around 19 percent points are 13 and then indoor environment 15 which is 22 percent, water efficiency 7 percent 5 and sustainable sites 14. So, you see the features are energy, materials, indoor environment, additional innovation and design, sustainable sites and water efficiency.

And if you see point counts you know this is 17 plus 13 plus 15 plus 5 so this makes it 30 20 50 55 plus 14 55 plus 14 makes it 69. Additionally you can get another 5, so 69 points so innovation and design you can get it additionally. So out of 69, you know 69 you can get plus another 5 you can get, if there is some innovation and design as per the criteria given. So, that is what it is.

(Refer Slide Time: 12:55)




So, supposing you are optimizing the energy performance you get 1 credit. Measurement and verification is there you get 5 credit, 6 using green power. They are prerequisites for example fundamental commissioning, minimum energy performance is actually prerequisite, right and fluorocarbon reduction and all that in the refrigeration systems. These certain mandatory requirements are very much there.


Thus prerequisite if you do not have you would not get it. Supposing you get green power then you get some more credit. Measurement and verification you get some more credit. Ozone protection that is you know like fluorocarbon system you are not using in your refrigeration and all that or if you are reducing the ozone issues protecting the ozone, additional commissioning renewable energy etc etc. So, you see if you are using wind power, using some renewable energy solar panels etc etc you get power.

(Refer Slide Time: 14:11)

CREDITS DISTRIBUTION LEED



- The mandatory provisions (Sections 5.4(B), 6.4 (H), 7.4(SWH), 8.4(P), 9.4 (L) and 10.4) of ASHRAE/ IESNA Standard 90.1-2004 (without amendments)
- The prescriptive requirements (Sections 5.5, 6.5, 7.5 and 9.5) or performance requirements (Section 11) of ASHRAE/IESNA Standard 90.1-2004 (without amendments).
- ECBC of the BEE, India, as and when it is released.

28 May 2010 

So, mandatory provisions that is there in the LEED document section 5.4 B or 6.4 H etc etc. These are the according to the ASHRAE or IESNA or American society of heating refrigeration and air conditioning engineers, standard this without amendment. The prescriptive requirement for this are also given. So, at par it should be ASHRAE so guidelines and in India of course ECBC of the you know this is ECBC is the we have already talked about this energy conservation building codes. So, as when it was released and made so it was as par this. So, minimum specification should be according to that, right.


(Refer Slide Time: 15:05)

E&A Credit 1 Optimize Energy Performance

OPTION 1 — WHOLE BUILDING ENERGY SIMULATION (1–10 Points)

New Building	Existing Building	LEED Rating
10.5%	3.5%	1
14%	7%	2
17.5%	10.5%	3
21%	14%	4
24.5%	17.5%	5
28%	21%	6
31.5%	24.5%	7
35%	28%	8
38.5%	31.5%	9
42%	35%	10

Energy cost savings percentage for each point threshold = $100 \times (1 - \frac{PB}{BB})$

28 May 2010 

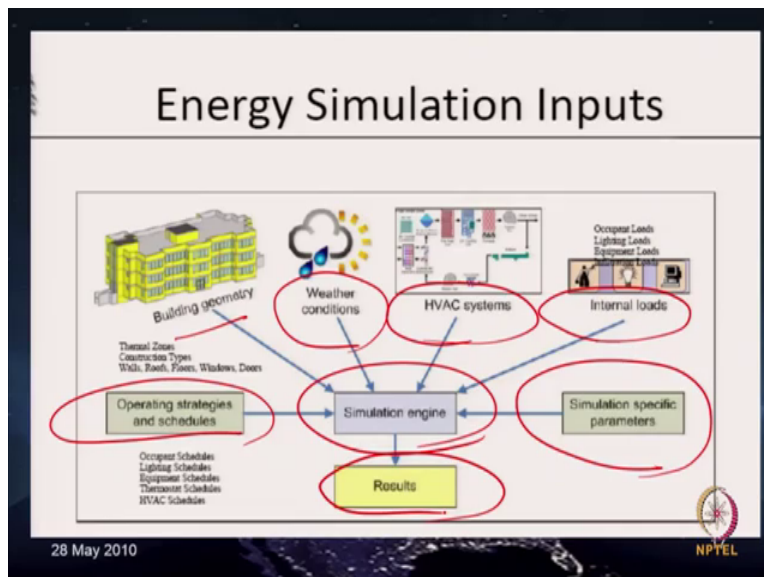
- **OPTION 2 — PRESCRIPTIVE COMPLIANCE PATH (4 Points)**
 - less than 20,000 sq ft
 - must be office occupancy
 - Advanced Energy Design Guide for the climate zone in which the building is located
- **OPTION 3 — PRESCRIPTIVE COMPLIANCE PATH (1Point)**

Then if you reduce down the energy you can get 10 points right if you reduce down the energy by 42 percent from a reference you get 10 points. If you reduce down the new building 10.5 percent from a reference then you get 1 point and so on. You you have to prove it. There is a methodology to calculate out and you have to prove that you actually reduced down the energy then the standard building or standard scenario where 42 percent you get 10.

If it is an existing building and you want LEED rating then 3.5 and this should be 35 percent. So, there has to be prescriptive compliances first must be satisfied, right and then you know this must be satisfied first of all. So, this 10 points you can actually get depending upon the guidelines that is given that if you have saved so much of energy you get this much of point. So, one of demonstration procedure is also given possibly you will be using a software and then show and I can get the you know for example like ECBC guidelines gives you certain specific types of softwares which you can use.

Capability of the software for example it must be able to calculate or the annual energy load, robust softwares and so on. So, several features of the softwares are already specified in energy codes and according to that you calculate and show that you have actually achieved some percentage of energy saving then you will get these sort of points you know. So, percentage wise obviously you can actually percentage wise saving you can get and therefore correspondingly you can get points. So, this is energy related.

(Refer Slide Time: 17:03)



So you have simulation inputs. That is what I am saying software. So, building geometry, simulation engine which are specified like energy plus ecotect or possibly equest and so on. There are several of them robust energy simulators. Then climate and weather conditions data would be available HVAC system and internal loads, appliances and things like that what you call casual load and then simulation specific parameters, operating strategies and schedules because if it is a office then it might be 8 hourly cooling, rather than a hospital which is 24 hourly. We have seen that earlier also.

And then you get the results and through the results you should be able to show that you have reduced the energy consumption.

(Refer Slide Time: 18:01)

Sustainable Sites (max 13 points)	
Prerequisite Erosion & Sedimentation Control Required	
Credit 1 Site Selection	1
Credit 2 Development Density & Community Connectivity	1
Credit 3 Brownfield Redevelopment	1
Credit 4.1 Alternative Transportation, Public Transportation Access	1
Credit 4.2 Alternative Transportation, Low Emission & Alternative Fuel Refueling Stations	1
Credit 4.3 Alternative Transportation, Parking Capacity	1
Credit 5.1 Reduce Site Disturbance: Protect or Restore Habitat	1
Credit 5.2 Reduce Site Disturbance: Development Footprint	1
Credit 6.1 Stormwater Design :Quantity Control	1
Credit 6.2 Stormwater Design :Quality Control	1
Credit 7.1 Heat Island Effect: Non - roof	1
Credit 7.2 Heat Island Effect: Roof	1
Credit 8.0 Light pollution reduction	1
13	

Then sustainable sites 13 points, site selection 1 point, development density and community connectivity 1 point and for each 1 of them. What will qualify that is given, right. Brown field development if you are doing then you get 1 point. Alternative transportation, public transport excess this is you provide then you get 1 point. Alternative you know a low emission for example if you have electrically driven, right.

Today you have all kind of 3 wheelers electrically driven vehicles so then you get 1 point. Alternative parking capacity, site disturbances restore the habitat of any flora or fauna and reduce the site disturbances. ((18:56)) storm water design quality control of this one, quantity and quality control, heat island effect and so on light pollution reduction etc so if you do you get points. So, this is how you get points for example from site selection, right.

(Refer Slide Time: 19:18)

Water Efficiency (max 6 points)

- Credit 1.1 Water efficient landscaping, reduce by 50%
1
- Credit 1.2 Water efficient landscaping, no potable use or no irrigation
1
- Credit 2.0 Water Efficiency in Air conditioning System: Reduce by 50%
1
- Credit 3.0 Innovative wastewater technologies
1
- Credit 4.1 Water use reduction, 20% reduction
1
- Credit 4.2 Water use reduction, 30% reduction
1

6

DEPARTMENT OF CIVIL ENGINEERING, IIT DELHI

NPTEL

Water efficiency 6 points, landscaping you know so reduce the water run off by 50 percent you get 1 point. No portable use or no irrigation water efficient landscaping as I said so you get 1 more point. Air conditioning system if it is water efficient you get 1 point. Innovative waste water technologies, recycling them using them etc and each 1 is given in details, right does not require very great thinking, or great computation or skill or anything of that kind. You have got to see and if you think you can do it you will you have done in the site and demonstrate that you have done in this site in your documentation. They will come and inspect and these points you will get. So, water use reduction 30 percent water use reduction 20 percent etc etc.

(Refer Slide Time: 20:20)

Energy & Atmosphere (max 17 points)

- Prerequisite 1 Fundamental Building systems commissioning Required**
- Prerequisite 2 Minimum Energy Performance Required**
- Prerequisite 3 CFC Reduction in HVAC & R Equipment Required**
- Credit 1 Optimise energy performance 10
- Credit 2 Onsite Renewable Energy, 2.5%, 5%, 7.5% 3
- Credit 3.0 Additional Commissioning 1
- Credit 4.0 Ozone Depletion 1
- Credit 5.0 Measurement & Verification 1
- Credit 6.0 Green Power, 50% 1

17

DEPARTMENT OF CIVIL ENGINEERING, IIT DELHI

NPTEL

Then energy and atmosphere you know so HVAC equipment require optimize the machines basically. 10 onsite renewable energy, earlier I was talking of envelope 10 points right. Here now you have the machines. So, additional commissioning, ozone depletion, issues for example not using those (CFCs)(20:43) which could lead to ozone depletion. Minimum of course is specified already. Beyond that if you are using such system for refrigeration which does not have any kind of environmental impact including ozone depletion you get 1 point. And total again green power 17. So, if you are using green power, solar power to do the refrigeration or cooling 17. So, total 17.

(Refer Slide Time: 21:11)

Materials & Resources (max 13 points)	
Prerequisite 1 Storage and collection of recyclables Required	
Credit 1.1 Building reuse, maintain 75% of existing walls, floors and roof	1
Credit 1.2 Building reuse, maintain 100% of existing walls, floors and roof	1
Credit 1.3 Building reuse, maintain 100% shell + 50% non shell	1
Credit 2.1 Construction waste management, Divert 50% from disposal	1
Credit 2.2 Construction waste management, Divert 75% from disposal	1
Credit 3.1 Resource Reuse, 5%	1
Credit 3.2 Resource Reuse, 10%	1
Credit 4.1 Recycled Content, 5%	1
Credit 4.2 Recycled content, 10%	1
Credit 5.1 Regional Materials, 20%	1
Credit 5.2 Regional Materials, 50%	1
Credit 6.0 Rapidly renewable materials, 5% of Building Material	1
Credit 7.0 Certified wood, 50% of wood based materials	1
13	

So in this manner we have seen 3 of them, materials and resources 13, recycle reuse 75 percent of the existing walls, floors, roofs retrofitting it. So, using you know the same in the new Brown Field development sort of. Building reuse 100 percent of existing wall and then remodel it, complete shell and if you are reusing it 50 percent, non shell 1 point.

Waste management, construction waste management during constructing new building so divert 50 percent from disposal use them there itself 75 percent you get additional 1 point. Resource reuse, recycled content, regional materials local materials, and rapid renewable materials, and certified wood etc. So, this is how again you get 13 points. So, you can see that 10, 6, 17 and then 13 you know in this way the number of points (CFCs)(22:16).

(Refer Slide Time: 22:18)

Indoor Environmental Quality (max 15points)	
Prerequisite 1 Minimum IAQ performance Required	
Prerequisite 2 Environmental Tobacco Smoke Control Required	
Credit 1 Outdoor Air Delivery Monitoring	1
Credit 2 Increased Ventilation, 30% above ASHRAE 62.1 requirements	1
Credit 3.1 Construction IAQ management plan, during construction	1
Credit 3.2 Construction IAQ management plan, before occupancy	1
Credit 4.1 Low emitting materials, adhesives & sealants	1
Credit 4.2 Low emitting materials, Paints	1
Credit 4.3 Low emitting materials, carpet	1
Credit 4.4 Low emitting materials, Composite wood & Agrifiber products	1
Credit 5.0 Indoor chemical & pollutant source control	1
Credit 6.1 Controllability of Systems, Lighting	1
Credit 6.2 Controllability of systems, Thermal comfort	1
Credit 7.1 Thermal comfort, Design	1
Credit 7.2 Thermal comfort, Verification - 6 to 18 months	1
Credit 8.1 Daylight, daylight 75% of spaces	1
Credit 8.2 Views, Views for 90% of spaces	1
15	

Environment quality maximum 15 points. And you know environmental air quality performance required is this IAQ is environmental air quality. Outdoor air delivery monitoring, increased ventilation 30 percent above ASHRAE these requirements. Construction indoor air quality actually you know management plan during construction, construction indoor air quality management before occupancy and so on.

Low emitting materials, paints which you have discussed, carpets this is why you discussed this earlier trying to built it up now. So, all of them are there adhesive and sealants. Remember we discussed sometime earlier and you know Agrifiber products indoor chemical pollutant source. We looked into each one of them some of those simple issues that related to them we have discussed. And if you have designed them all of them for example thermal comfort design 1, verification and if you do verification scheme is also there. Measure the temperature and maybe found out something like some indexes and seen that it is working fine daylight and soon on. So, 15 you can get.

(Refer Slide Time: 23:38)

Credit	Description	Points
Innovation & Design process (max 5 points)		
Credit 1.1	Innovation in design	1
Credit 1.2	Innovation in design	1
Credit 1.3	Innovation in design	1
Credit 1.4	Innovation in design	1
Credit 2	LEED Accredited Professionals	1
5		
Total Maximum Points		69

$LR = LR1 + LR2 + LR3 + LR4 + LR5 + LR6$

DEPARTMENT OF CIVIL ENGINEERING, IIT DELHI

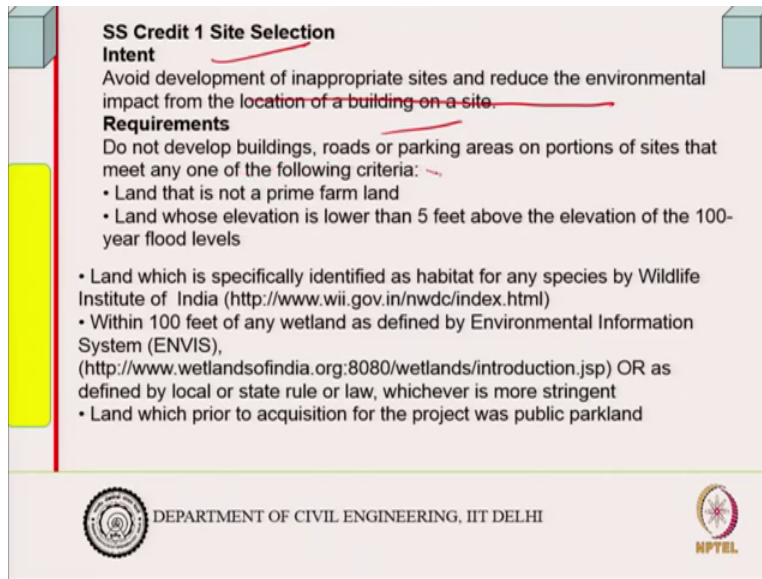
NPTEL

Then innovation and design maximum 5 points. Some innovation and design, but they have given you guidelines what it is because it is a very grey kind of a statement innovation and design. So, if you have involved LEED accredited professionals you get 1. They do accredit those people. So, there are number of them consultant today. So, total maximum you can get 69 and percentage 100. 100 percent corresponds to 69. So, lr1, lr2, lr3 etc etc LEED rating 1, LEED rating 2, LEED rating 3 sum total and if your sum goes beyond 52 then you get a platinum rating.

If it is just around 26 to 32 you are certified below that you are not at all anything. So, that is how it is and all other systems follow same. Depending upon the feature they give you a number and this number are based on experts opinion you know. They might have done a questionnaire survey I am not sure actually because this is not really very physical quantified methodology. It can be done whether it has been done or not I could not find out because in background literature I checked for LEED and I could not find out.

If it is there now I am not sure, but you can take interviews or opinions of very large number of people construction management, operational research we have got techniques for similar kind of thing. And from that you try to arrive at, there are several techniques factor analysis, fuzzy analytical hierarchy procedures. So, you ask them which are the most important factors eliminate them. So, it might evolve all the time, it might change also but at the moment this is the scenario and this is the kind of rating.

(Refer Slide Time: 25:44)



SS Credit 1 Site Selection

Intent
Avoid development of inappropriate sites and reduce the environmental impact from the ~~location of a building on a site.~~

Requirements
Do not develop buildings, roads or parking areas on portions of sites that meet any one of the following criteria:

- Land that is not a prime farm land
- Land whose elevation is lower than 5 feet above the elevation of the 100-year flood levels
- Land which is specifically identified as habitat for any species by Wildlife Institute of India (<http://www.wii.gov.in/nwdc/index.html>)
- Within 100 feet of any wetland as defined by Environmental Information System (ENVIS), (<http://www.wetlandsofindia.org:8080/wetlands/introduction.jsp>) OR as defined by local or state rule or law, whichever is more stringent
- Land which prior to acquisition for the project was public parkland

DEPARTMENT OF CIVIL ENGINEERING, IIT DELHI

NPTEL

So, this is let me see this is the same thing. So, basically first is site selection of inappropriate site reduce the environmental impact and do not develop building roads parking areas but you can actually after knowing this point and what relates to this point you can even optimize, right if the decision variables are somewhat rather quantified or codified. If the decision variables are quantified or codified you can actually maximize the rating. So, you know use an optimization tool you can actually maximize the rating even before planning or during the design studies. So, I think I will stop here. Next class we will look beyond this, okay. Any questions quickly, I will answer.