"Examining GITAM (Deemed to be University) and Osmania Universities in Hyderabad for Crime Prevention through Environmental Design measures": A foundation towards a safe CPTED exterior campus model

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Abstract

Campus violence in India is a significant public health issue that needs to be addressed in the present scenario. It affects the user groups physically and psychologically. As per the statistical report of Global Coalition to Protect Education from Attack (GCPEA) in 2020-21, the total crime incidents occurred in India are 136 along with 2385 harmed members.Out of which the crime rate in Telangana has increased by 4.4% from 2021-2022. The paper attempts to highlight various emerging problems in most of the Indian campuses and as an architect, what has to be adopted while planning for spaces to prevent Crime through Environmental Designing (CPTED) in future is explained. These are achieved by conducting surveys and analyzing based on users and author's perception at Gandhi Institute of Technology and Management (GITAM) and Osmania University (OU) campuses of Hyderabad. Along with these, secondary data from relevant research papers were obtained and finally formulating architectural findings for an exterior safe campus model. The scope for future research, are adopting the mentioned findings in future campuses and checking for crime reduction rate, along with interior spaces and mechanical systems for CPTED measures. The result

of this paper has important implications for the college authorities in India to find practical solutions and plan student-friendly frameworks to prevent violence on a macro level in campuses.

1. Introduction

Safety and security problems have always been a challenge in all the campus environments. For a place to feel safer, effective use of planning, designing and detailing can aid in reduction in campus crime, along with the fourth element of architecture being "safety and security".

GITAM (Deemed to University), is a private educational institute in Rudraram village of Hyderabad, designed over 230 acres, located 1.8 kilometers away from Mumbai highway, with around 5000 students and more than 500 staff members. Osmania University established in 1918, and one of the oldest Government campuses in Hyderabad, designed in 1600 acres with 3,00,000 students and 5000 staff members along the metro and other public transport adjacent to the site. Crime prevention through environmental design (CPTED) is a cost-effective strategy that adopts appropriate landscape designing, fencing, lighting, building positioning, and planning to reduce criminal activity without active measures and comprises of four main principles: Natural surveillance, access control, territorial reinforcement, and space management or maintenance along with Geographical juxtaposition as a new theory in CPTED. Elements of CPTED Principles are depicted (Figure 1).
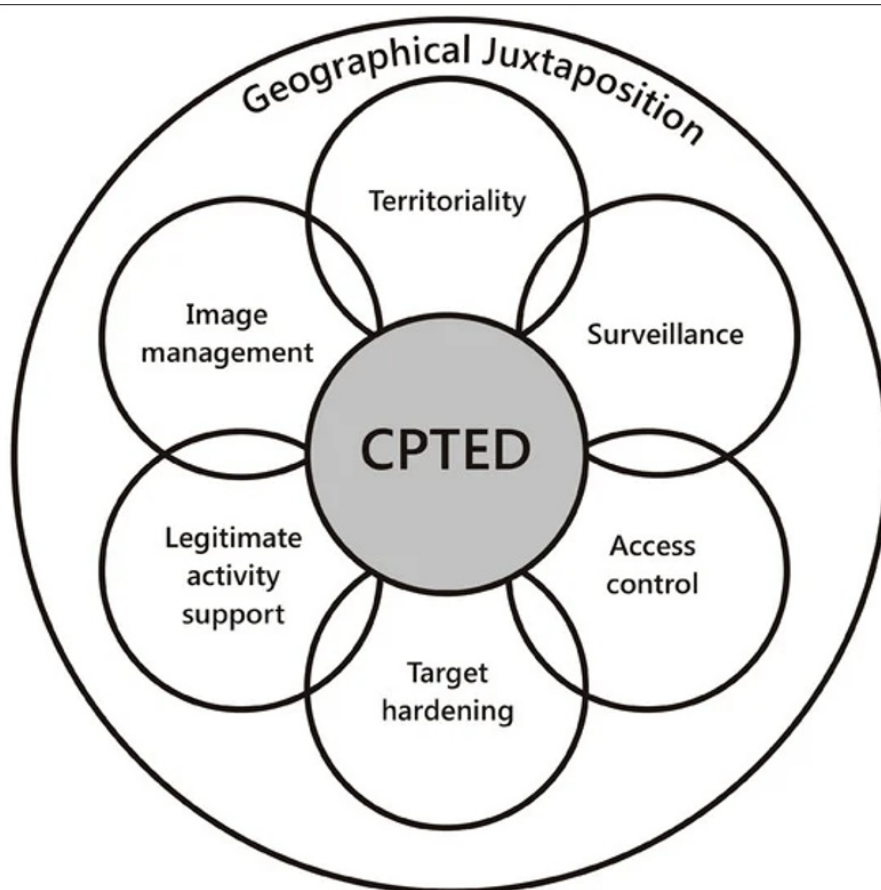
Figure 1. A revised CPTED Model (Cozens 2016)

Following are the problems identified on a macro level on campuses are:

- Increased crime rate
- Lack of structured and secured parking facilities
- Poor fencing, landscape, and lighting
- Multiple entrances during the day
- Reception area far from main entrances
- Many independent buildings
- Isolated buildings/Occasionally used spaces
- Safety, security not made mandatory in building codes
- Planners negligence

1.1. CPTED Theory

C.Ray Jeffery first coined the term of "Crime Prevention through Environmental Design". He posited how thoughtful and effective use of environment could reduce fear of crime and violence; improve quality of life for individuals in the environment. Oscar Newman (First CPTED generator) considered the principles of defensible space such as territoriality, natural surveillance, image and mileu in urban settings to bring the set environment in control of residents, to reduce

crime opportunities.

First generation CPTED (1960-70's): This was first applied in planning urban areas, but its strategies were applied to school campuses as well. It includes the following:

1.1.1. Natural surveillance: Provides opportunities to see and be seen. Helps in maximizing visibility.

1.1.2. Access control: Doors, fences, gates, paths, gardens or any guiding path.

1.1.3. Territoriality reinforcement: defines ownership and intended use of spaces.

1.1.4. Management and maintenance: evidences that the space is cared for.

This provides low cost methods for improving community security, but doesn't address social and interpersonal factors that affect crime and violence.

Second generation CPTED (1980-90's): considers neighborhood health and social ecology for prevention. It includes four principles: social cohesion (this includes inclusive activities to create sense of unity i.e., territoriality reinforcement), connectivity (situate campus as part of a community to promote connections), threshold capacity(create spaces to ensure balance and multiple usage), community center(social activities that engages members of campus).

Third generation (2000's –present): A holistic approach. Considers psychological and emotional factors. Emphasizes inclusivity, sustainability and deep community needs.

1.2. Crime statistics in Hyderabad
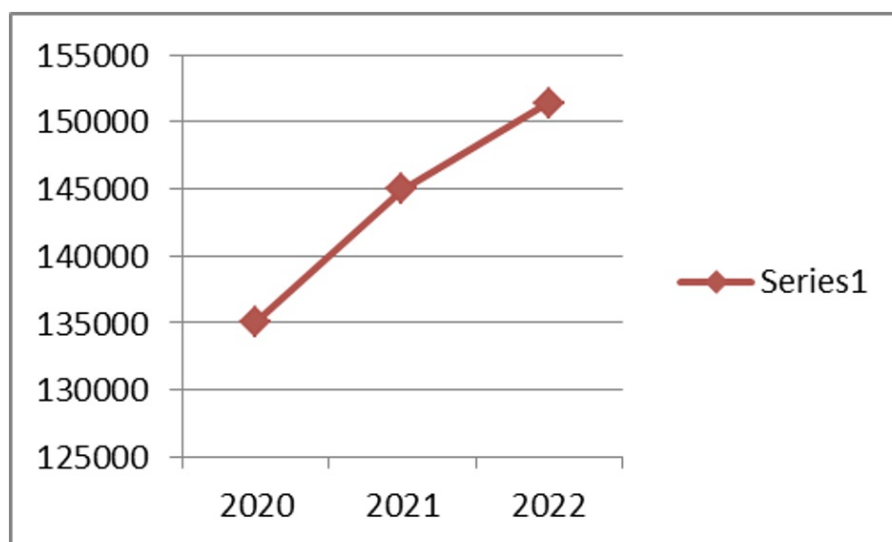
Figure 2. Crime statistical report (Source: (hindu, 2022)

Crime rate in Telangana has increased by 4.4% from 2021-22.Out of which most are attack over women and girls and

sexual violence. As per GCPEA Survey report, 55 attacks over students, staff experienced during education related protests. (Source: https://protectingeducation.org/wp-content/uploads/eua_2022_india.pdf).

1.3. CPTED Principles

1.3.1. Geographical Juxtaposition: It refers to the capacity of surrounding spaces influencing the safety and security of adjacent areas and vice versa (Newman, 1972. (1972).As per Global Coalition to Protect Education from Attack guidelines, new campuses needs to be placed in a amore secure and accessible location, work with local communities, the new area selected is near a ton or village so that it is not isolated. Adequate boundary wall or fences needs to be provided.

1.3.2. Territoriality reinforcement: Explains transition of zones i.e. public, private, semi- private and private spaces for enhancing security. It sends a message of ownership. Example: Vegetation, fencing, decorative elements, water features, signage etc.

1.3.3. Natural surveillance: People can see what others are doing, thereby minimizing the would-be offenders from committing crime. Examples: Security grilles and doors, Effective lighting and windows, street designing, Proper landscaping, CCTV monitoring etc.

1.3.4. Access control: Helps in denying targeted access. Examples: Bollards, fencing designing, Alarm systems, gates, etc.

1.3.5. Maintenance: A well-maintained area attracts people and creates a sense of safety and security. Examples: vandal-proof and antiskid materials, Street lighting, Remove graffiti, etc.

1.4. CPTED Design considerations

1.4.1. Entrances: Entrances which are not visible from the public domain can provide opportunities for felonious to hide or create violence. a.) Entrances should be at prominent positions b.) Proper directional signage to be provided c.) Minimize the number of entry points and provide higher security checks d.) Natural surveillance must be provided from streets e.) Avoid blank walls fronting streets f.) Offices should be planned to face the street activities g.) Security through RFID Card access into entries post working hours.
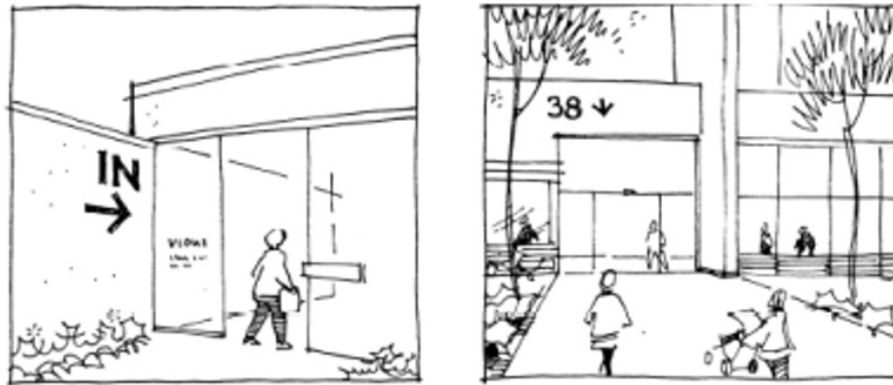
Figure 3. Image depicting entrances (Plan, 2014)
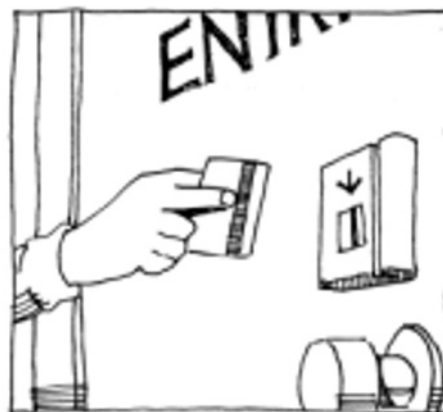
Figure 4. Image depicting controlled access
through card (Plan, 2014)

1.4.2. Lighting: Pedestrian pathways, laneways, and access routes should be lit adhered to the national lighting code (SP72: 2010) for adequate exterior illumination levels. Lighting should have a wide beam of illumination, which reaches the beam of next light. Lighting should be designed to recognize the faces of passersby. Lighting should be vandal-tough. Illuminate possible places for intruders to hide. A face should be identifiable from 15m. Energy-efficient lights to be adopted to save energy. Maintain lighting levels as per SP72:2010 Lighting code

Application	Risk Classification	Maintained average horizontal illuminance (lux)	Uniformity ratio E_{min}/E_{av}
Isolated remote strips	Low risk	5	0.15
	Medium risk	10	0.25
	High risk	20	0.25
Close-in strips	Low risk	10	0.25
	Medium risk	20	0.25
	High risk	50	0.30
Waterfront strips	Low risk	10	0.25
	Medium risk	20	0.25
	High risk	50	0.30
Storage zones	Low risk	5	0.15
	Medium risk	10	0.25
	High risk	20	0.25
Entrance zones	All	50	0.30
Traffic zones			
a) Walking	All	5	0.15
b) Traffic	All	10	0.25
Special security fences	High risk	50	0.30

Table 1. Recommended values of illuminance and uniform ratio for security lighting (SP7:2010)

1.4.3. Fencing: If fencing is too high, natural surveillance of streets becomes difficult, this in turn, can have larger chances of committing crime. Front fences should not be higher than 1.2m. A higher fence is acceptable if made of open materials example, wrought iron etc. If noise insulation is required at the building level, use double-glazed glass rather than a high solid fence (Figure 9).
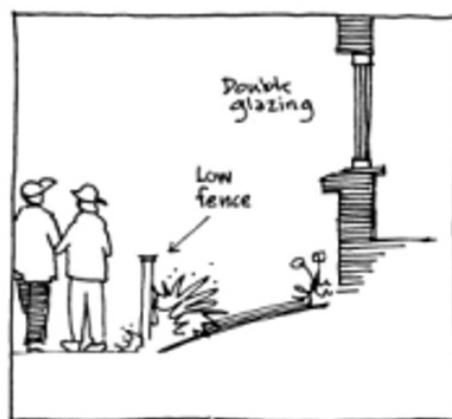

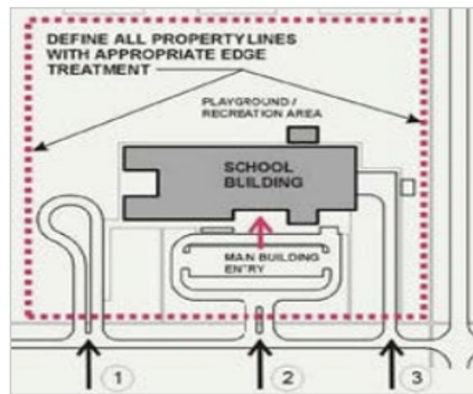**Figure 5.** Image depicting boundary wall (Plan, 2014)

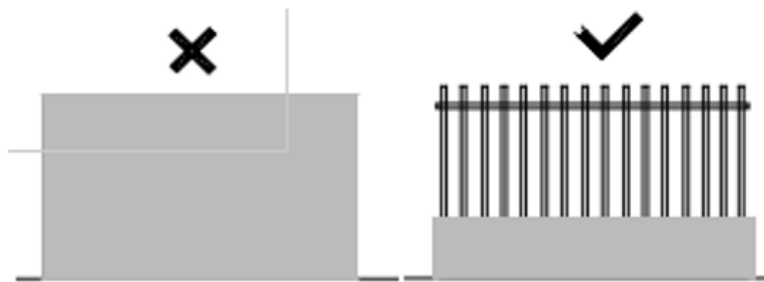**Figure 6.** Image depicting entry points
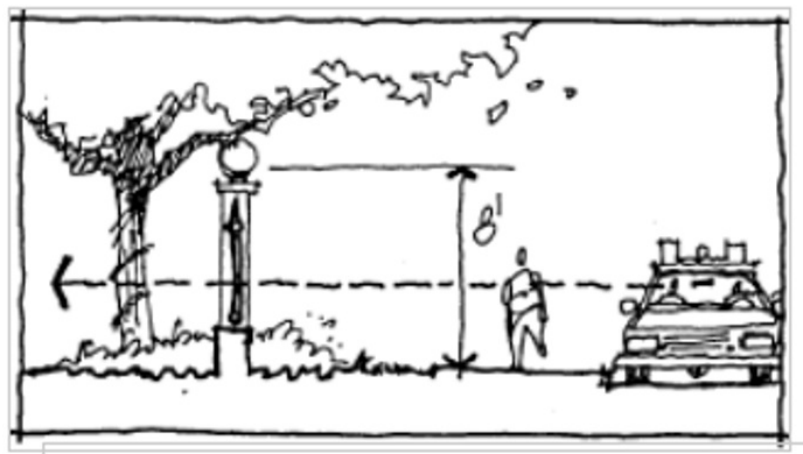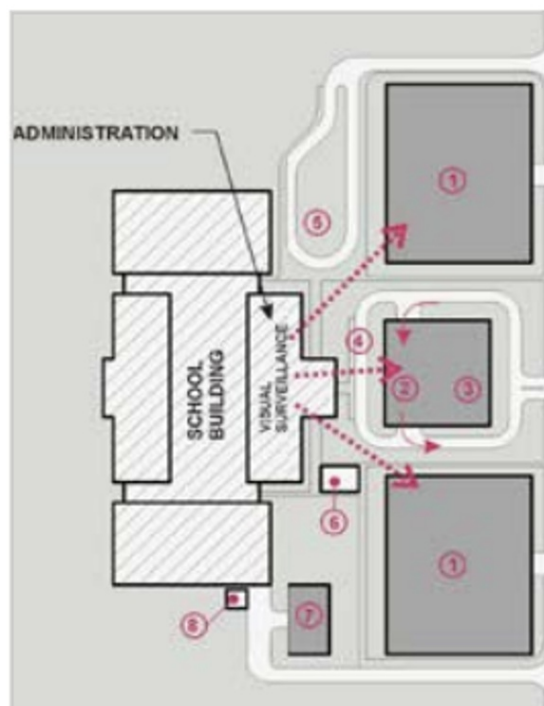

Figure 7. Boundary wall design

Figure 8. Natural surveillance through boundary wall

Figure 9. Parking zones (1-zoned parking, 2,3- visitors, staff, 4-parent's drop off, 5-bus drop)

1.4.4. Landscaping: Trees and shrubs inappropriately located can reduce natural surveillance and can form entrapment spots. Avoid medium-height vegetation with thick cylindrical foliage. Plants with low hedges and high canopied trees with clean trunks are suitable for natural surveillance. Avoid vegetation screening for public toilets. Use green screens to minimize graffiti (Figure 10). Trees should be trimmed upto 2.4m and shrubs not more than 600-750mm in height. Trees to be away from the building line.Street furniture should be away from building edges.

**Figure 10.** Ways to eliminate graffiti (Plan, 2014)

1.4.5. Car parking: Lighting and signages can make parking area safer. Avoid pedestrian and vehicular movement conflicts. Passive surveillance is to be made possible. Car parks minimize dark areas through proper lighting. Large car parks to adopt telephones or emergency alarms or intercoms. Appropriate signage's at parking are to be adopted. All

surfaces at the parking level to be in light colors to reflect as much light as possible. All entrapment points to be avoided such as blind corners, under stairs, wide columns etc. adequate lighting and mirrors to be provided where design features are unavoidable. These areas need to be accessible and visible to all.

1.4.6. Public areas: Playgrounds or car parking, or any open spaces should have natural surveillance from building windows. Communal areas like garbage bays to be well-lit and monitored. Elevators or stairwells are to be provided with open style or transparent over doors or walls. Waiting areas needs to be visible from building entries. Seating spaces are to be designed to have natural surveillance.

Figure 11. Transparency of vertical circulation zones (Plan, 2014)
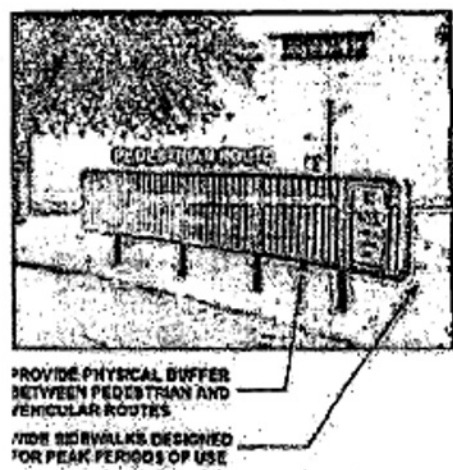
Figure 12. Safety buffer

1.4.7. Blind corners: Pathways should be direct and straight. Installation of convex mirrors to allow users to see ahead at corners. Installation of glass panels in the stairwell is advisable. If entrapment spots are unavoidable, need to be well lit or closed after hours. Avoid seating near ATMs, phone boxes, toilets, corridors, and isolated locations.

Building geometry: Buildings with U, O and H profiles result in courtyards protected on three or four sides. Hidden alcoves or entrances, serves as concealed areas for criminal activity. To improve visibility, chamfered corners are to be adopted. Administration areas need to have clear line of sight of playground, parking and roads.
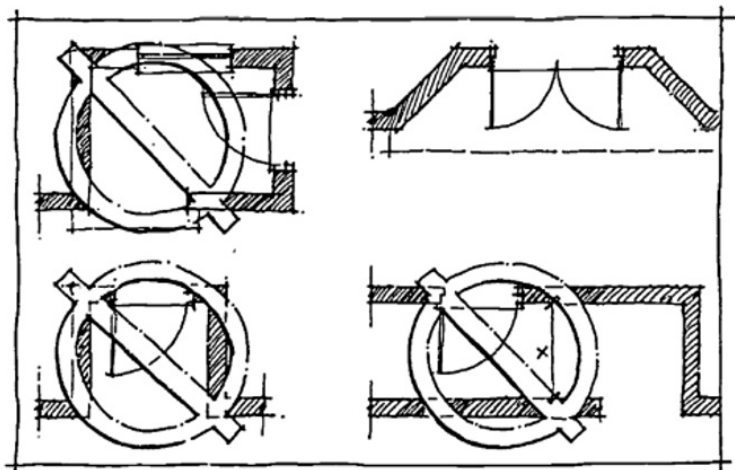
Figure 13. Recessed areas alternative solution (Plan, 2014)
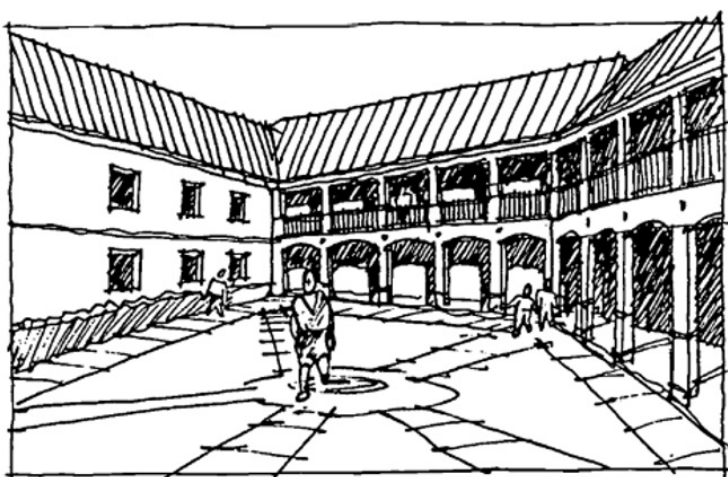
Figure 14. Central courtyard made lively (Plan, 2014)

1.5. Research questions

- Amongst various building types, which type has huge population and the highest probability of crime occurrences?
- As an architect, what can be done at planning level to reduce the crime rate (PROACTIVE APPROACH)?
- How can the future campuses benefit from this paper?
- How can campus blind spots be avoided while planning?
- What is the need for making CPTED Measures mandatory in Building bye-laws?

2. Methodology
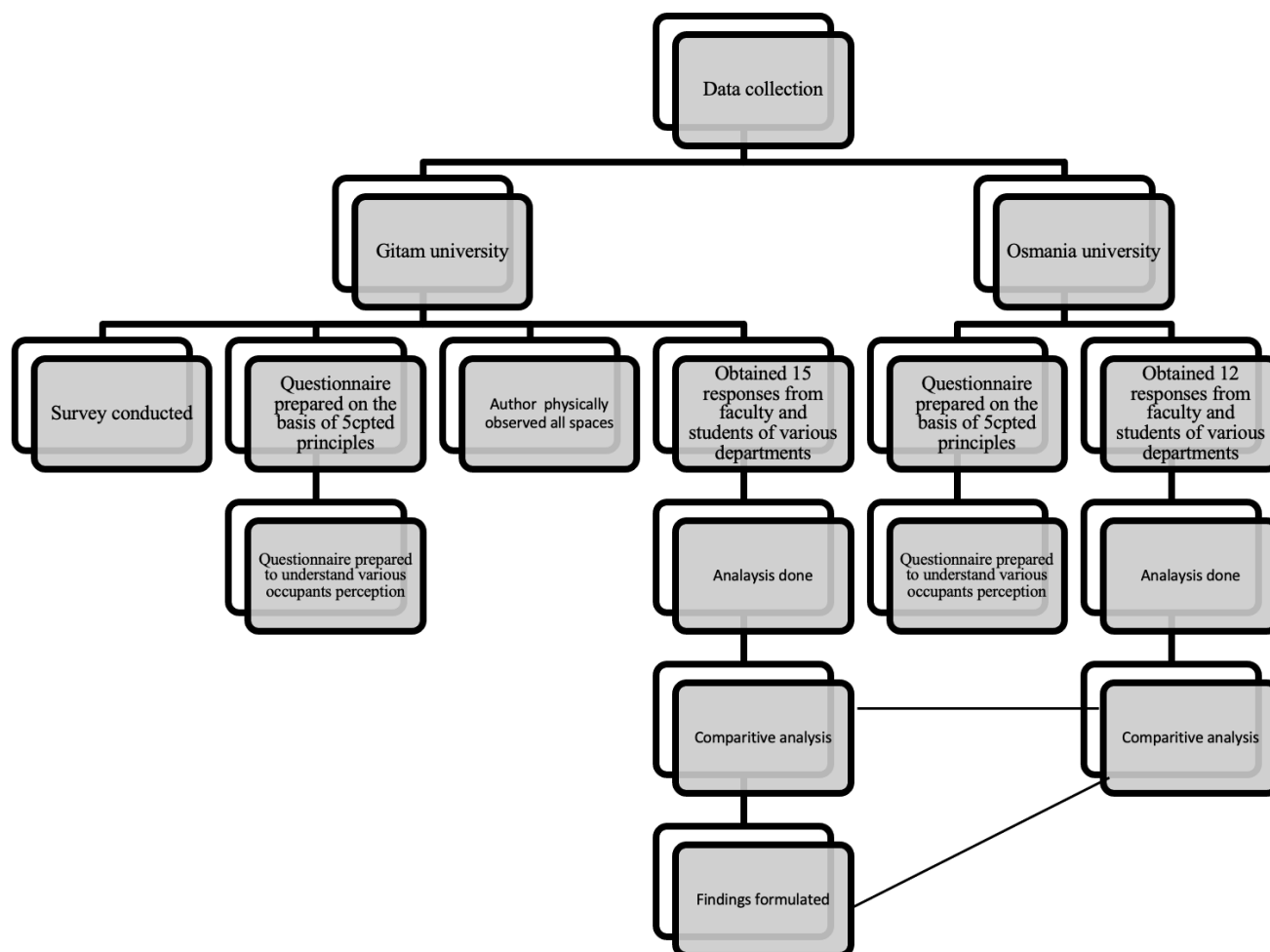
Challenges faced during survey: To deal with the fear of feeling safe. To obtain genuine and fearless opinions, name and other details were not mentioned.

3. Results and Comparitive Analysis

3.1. Gitam University Survey Results

		Respondent 1	Respondent 2	Respondent 3	Respondent 4	Respondent 5	Respondent 6	Respondent 7	Respondent 8	Average
GEOGRAPHICAL JUXTAPOSITION	How's the placement of campus?	100%	75%	50%	0%	0%	100%	50%	50%	70.83333333
GEOGRAPHICAL JUXTAPOSITION	How comfortable do you feel being in the campus?	100%	100%	50%	50%	75%	100%	50%	50%	71.875
MAINTENANCE	Does the campus lighting evenly illuminate the area?	100%	100%	100%	100%	100%	100%	100%	100%	100
NATURAL SURVEILLANCE	Do trees/bushes obscure lighting?	100%	75%	100%	100%	100%	100%	100%	100%	96.875
NATURAL SURVEILLANCE	Are you able to identify any face 25 meters away?	100%	50%	0%	0%	0%	100%	0%	0%	83.33333333
ACCESS CONTROL	Does lighting illuminate direction signs or maps?	0%	0%	50%	50%	100%	0%	50%	50%	60
MAINTENANCE	Are there any signages? If so, do they show how to seek emergency assistance?	0%	0%	0%	0%	100%	0%	0%	0%	100
NATURAL SURVEILLANCE	Are there any hiding spaces?Do landscaping block sightlines?	100%	0%	100%	100%	0%	100%	100%	100%	100
NATURAL SURVEILLANCE	Is it easy to predict when will people be around?	100%	100%	0%	100%	100%	100%	0%	0%	100
NATURAL SURVEILLANCE	How far is the nearest person to call for help?	0%	25%	100%	100%	25%	0%	100%	100%	75
NATURAL SURVEILLANCE	Is the area designed for natural surveillance?	100%	100%	100%	100%	0%	100%	100%	100%	100
TERRITORIALITY	How easy would it be for an offender to disappear?	25%	25%	100%	0%	0%	25%	100%	100%	62.5
TERRITORIALITY	Is there more than one exit?	100%	100%	0%	0%	100%	100%	0%	0%	100
NATURAL SURVEILLANCE	Are there any activities post college timings? If so, does these levels provide passive surveillance?	0%	100%	0%	0%	100%	0%	0%	0%	100
TERRITORIALITY	Does the place feel cared for?	0%	100%	0%	0%	50%	0%	0%	0%	75
TERRITORIALITY	Is the site clearly defined? Is there any definition between public and private space?	0%	0%	100%	100%	100%	0%	100%	100%	100

		Respondent 1	Respondent 2	Respondent 3	Average
TERRITORIALITY	1. I feel safe while walking to and from my vehicle in the parking ramp	0%	75%	100%	88%
NATURAL SURVEILLANCE	2. I think it's possible for offenders to hide in parking area	100%	0%	0%	100%
NATURAL SURVEILLANCE	3. I think it's possible for offenders to hide within landscape	100%	0%	0%	100%
	4. Parking ramp is well lit	0%	25%	0%	25%
ACCESS CONTROL	5. I feel safe using stairs anytime	0%	100%	50%	75%
ACCESS CONTROL	6. I feel safe using elevators.	0%	100%	100%	100%
ACCESS CONTROL	7. I feel that my car may be vandalized anytime	100%	100%	75%	92%
ACCESS CONTROL	8. My car or bike has been vandalized before	100%	0%	0%	100%
NATURAL SURVEILLANCE	9. If you were being threatened, do you think other people would notice you?	0%	100%	75%	88%

NATURAL SURVEILLANCE	10. Do you think people would assist you if they noticed a crime taking place	0%	50%	0%	50%
ACCESS CONTROL	11. Are properties protected with security systems?	50%	25%	25%	33%
MAINTENANCE	12. Are security systems functioning and people aware of?	0%	25%	50%	38%
TERRITORIALITY	13. Is the campus free from places where criminals could hide?	0%	75%	75%	75%
MAINTENANCE	14. Is campus clean from rubbish/graffiti?	50%	100%	50%	66%
MAINTENANCE	15. Is the area free from nuisance activities	0%	100%	75%	88%
ACCESS CONTROL	16. I worry about my personal safety at campus	0%	0%	25%	25%
TERRITORIALITY	17. I feel safe going anywhere around campus in dark/daytime	0%	100%	75%	88%
TERRITORIALITY	18. Is way finding easy in the campus?	0%	25%	0%	25%

| NATURAL SURVEILLANCE	NATURAL SURVEILLANCE	ACCESS CONTROL	TERRITORIALITY	TERRITORIALITY	TERRITORIALITY	ACCESS CONTROL	ACCESS CONTROL	MAINTENANCE	ACCESS CONTROL
If you were being threatened on campus, do you think other people would notice you?	Do you think people would assist you if they noticed a crime taking place inside campus?	Are properties protected with security systems?	Is the campus free from places where criminals could hide?	Are there any blind spots in campus?	I feel safe going anywhere around campus in dark/daytime	How is lighting at campus level?	Do you think bio metric access or access control alone will stop outsiders from entering	Are there graffitti walls inside the campus?	Do you feel safe leaving your vehicles at the parking area?
75%	50%	75%	25%	100%	50%	75%	25%	100%	100%
75%	50%	75%	25%	100%	50%	75%	25%	100%	100%
50%	50%	25%	25%	100%	25%	75%	25%	100%	100%
75%	50%	25%	25%	100%	50%	75%	25%	100%	100%

| TERRITORIALITY	TERRITORIALITY	NATURAL SURVEILLANCE	TERRITORIALITY	TERRITORIALITY	ACCESS CONTROL	TERRITORIALITY	GEOGRAPHICAL JUXTAPOSITION
Are public, semipublic, private zones seperated on site?	Do you feel safe at mess zones?	Can users inside the building, from windows can monitor the on street activities?	Do you feel having scattered buildings in campus planning is better than a standalone one?	Is wayfinding easy in the campus?if no, why?	Have you observed any outsiders been allowed inside the campus in spite of having security	Any other issues faced in terms of safety in and around the campus?	Do you feel campuses centrally placed in the city or adjacent to main accessible busy routes or far from the main busy roads is better ?
100%	100%	50%	100%	0%	100%	0%	AWAY
100%	100%	50%	50%	0%	100%	0%	CITY CENTRE
0%	100%	50%	0%	0%	100%	0%	CIT Y CENTRE
100%	100%	50%	50%	0%	100%	0%	CIT Y CENTRE

Figure 15. At landscape area (Source: Author)

Figure 16. Infront of library (Source: Author)
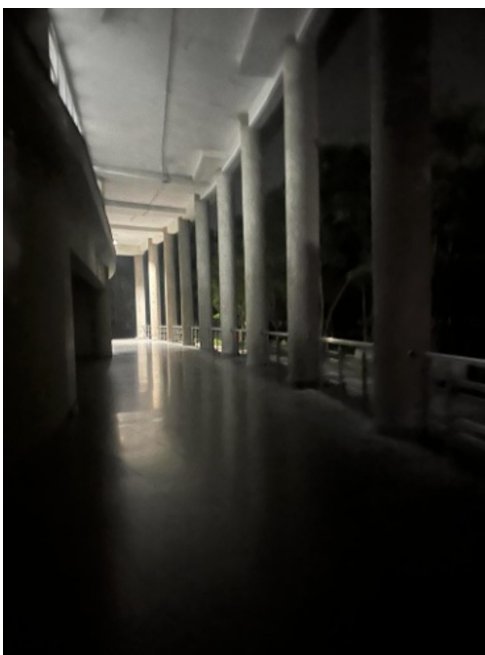
Figure 17. Ground floor level (Source: Author)
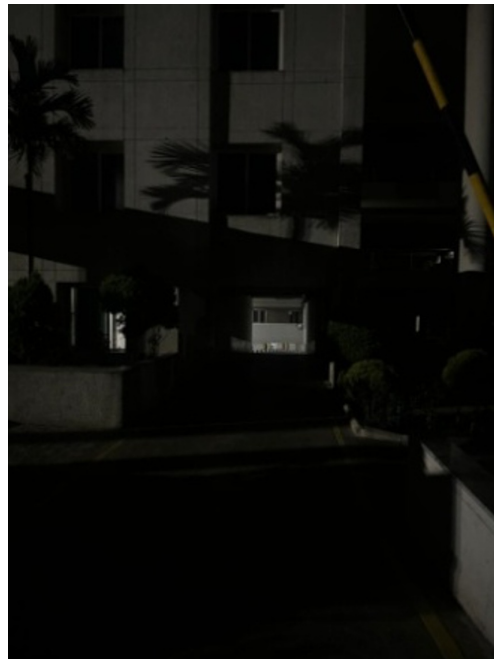
Figure 18. Under central courtyard ramp (Source: Author)

Figure 19. Under central courtyard ramp (daytime) (Source: Author)
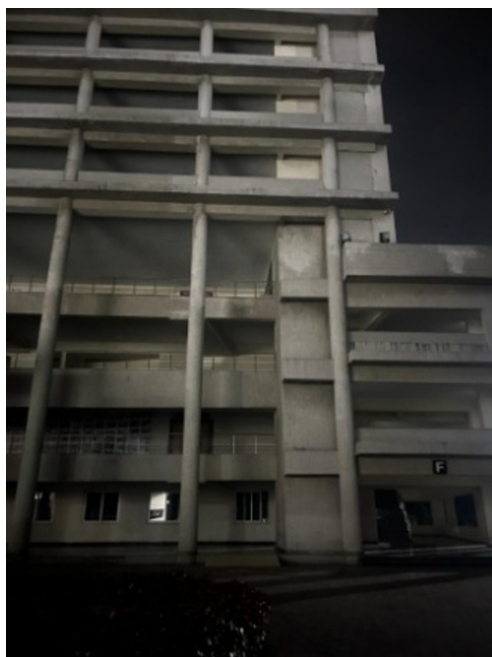
Figure 20. Infront of F block (blind spots zone)
(Source: Author)

Figure 21. Landscape area at rear side of
campus (Source: Author)
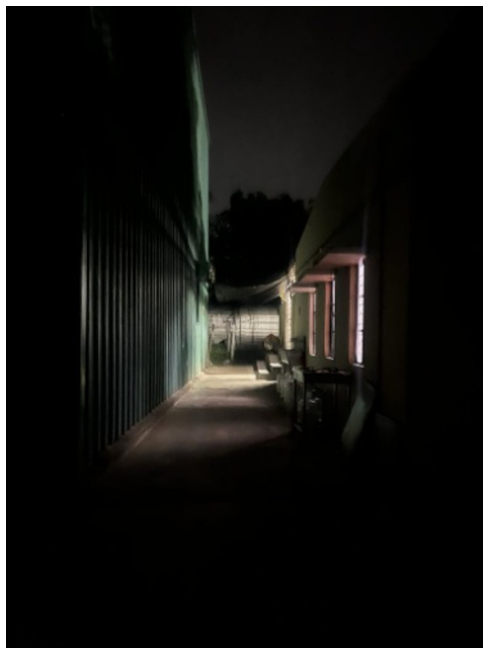
Figure 22. Space between canteens (Source: Author)

Figure 23. Infront of A, H blocks and ATM, canteens (Source: Author)
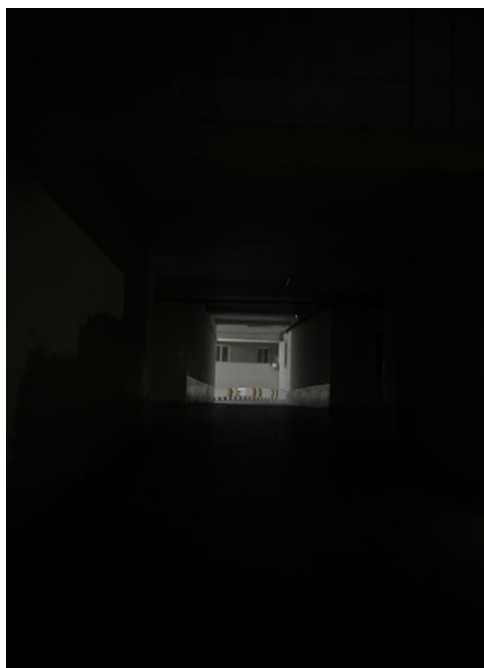
Figure 24. Parking night time (Source: Author)

Figure 25. Parking day time (Source: Author)

Figure 26. Boundary wall with mesh (Source: Author)

Figure 27. Entrapment spot under staircases
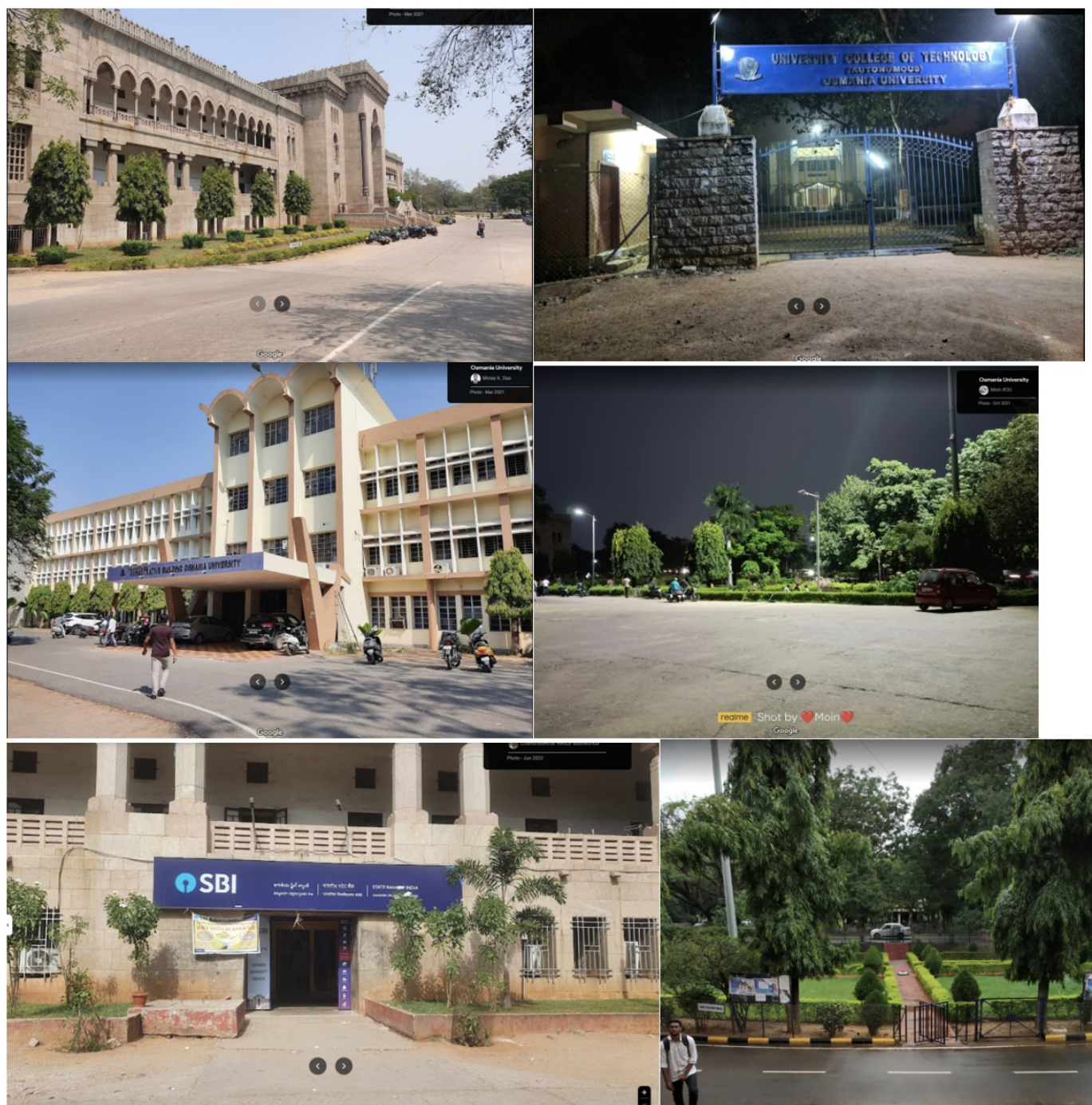
(Source: Author)

Figure 28. Street level and building level connectivity (Source: Author)

3.2. Osmania University Survey Results

NATURAL SURVEILLANCE	NATURAL SURVEILLANCE	ACCESS CONTROL	TERRITORIALITY	TERRITORIALITY	TERRITORIALITY	ACCESS CONTROL	ACCESS CONTROL	MAINTENANCE	ACCESS CONTROL	TERRITORIALITY
If you were being threatened on campus, do you think other people would notice you?	Do you think people would assist you if they noticed a crime taking place inside campus?	Are properties protected with security systems?	Is the campus free from places where criminals could hide?	Are there any blind spots in campus?	I feel safe going anywhere around campus in dark/daytime	How is lighting at campus level?	Do you think bio metric access or access control alone will stop outsiders from entering into campus?	Are there graffitti walls inside the campus?	Do you feel safe leaving your vehicles at the parking area?	Are public, semipublic, private zones seperated on site?
100%	75%	50%	25%	75%	75%	50%	50%	0%	100%	100%
75%	100%	75%	25%	75%	25%	50%	75%	0%	100%	100%
0%	100%	0%	100%	100%	50%	100%	25%	100%	100%	0%
50%	75%	75%	75%	50%	75%	50%	75%	0%	100%	100%
75%	75%	75%	50%	75%	25%	100%	75%	0%	100%	0%
100%	100%	75%		50%	75%	50%	75%	0%	100%	100%
75%	50%	50%	25%	100%	50%	50%	50%	100%	100%	100%
75%	50%	75%	75%	25%	75%	50%	50%	100%	100%	100%
75%	75%	75%	50%	50%	75%	100%	25%	0%	100%	100%
50%	75%	50%	25%	100%	25%	50%	25%	100%	100%	100%
75%	75%	75%	25%	25%	75%	50%	75%	0%	100%	
75%	50%	50%	75%	75%	25%	0%	100%	0%	100%	0%
69%	75%	60%	50%	67%	54%	58%	58%	33%	100%	73%

TERRITORIALITY	NATURAL SURVEILLANCE	TERRITORIALITY	TERRITORIALITY	ACCESS CONTROL	TERRITORIALITY	GEOGRAPHICAL JUXTAPOSITION
Do you feel safe at mess zones?	Can users inside the building, from windows can monitor the on street activities?	Do you feel having scattered buildings in campus planning is better than a standalone one?	Is wayfinding easy in the campus?if no, why?	Have you observed any outsiders been allowed inside the campus in spite of having security	Any other issues faced in terms of safety in and around the campus?	Do you feel campuses centrally placed in the city or adjacent to main accessible busy routes or far from the main busy roads is better ?
100%	100%	0%	100%	100%. Lot of Outsiders enter the campus premises	Being a semi closed campus. There are some safety issues on campus. If it were a closed campus lots of these could be avoided.	Main accesible busy routes is better.
100%	50%	50%	100%	100%		0%
100%	100%	100%	100%	100%	0%ne that I k0%w of	100%
100%	50%	50%	100%	50%	Zomato and Swizzy persons are 0%t feeling comfortable	all have their own positives and negatives
100%	0%	50%	100%..	50%	0% other issue	Yes
100%	100%	0%	100%	0%	0%	It is far from the main road and city
100%	50%	0%	0%	100%	0%t that I k0%w of	100%
100%	0%	0%	100%	0% I didn't observed any outsiders allowed into the campus	0%o	Adjacent to the main city
100%	50%	100%	100%	100%	Students are scared of dogs and some private people inside the campus	100%
100%	50%	100%	0%	100%	0%	Adjacent to main accessible busy routes
100%	0%					
0%	50%	100%	0%	100%	dogs are increasing, one of my classmates was bitten in the campus by a dog	centrally placed in city
92%	50%	50%	78%	78%	0%	75%

(Source: Google images)

Findings from the survey report:

GITAM University: Inappropriate location of the campus as per users, Trees /bushes obscure lighting, Difficulty in identifying face above 25m distance, lack of signages lighting, easy for an offender to disappear, unsafe parking areas, lack of safety at staircase, higher chances of vandalism, less functioning of security systems, lack of proper wayfinding, low monitoring of users of street activity, blind spots.

Osmania University: less functioning of security systems, blind spots, lack of safety in campus, lack of zoning, on street

activities cannot be monitored from windows, users not comfortable having scattered buildings, way finding not easy, intrusion of outsiders inspite of security at entrances, entry of dogs harming users, users feel campuses to be accessible to public transportation and in city Centre.

CPTED PRINCIPLES	Literature study	GITAM UNIVERSITY	OSMANIA UNIVERSITY	RECOMMENDATIONS/FINDINGS
GEOGRAPHICAL JUXTAPOSITION	As per Global Coalition to Protect Education from Attack guidelines, new campuses needs to be placed in a more secure and accessible location, work with local communities, the new area selected is near a ton or village so that it is not isolated. Adequate boundary wall or fences needs to be provided.	Inappropriate location of the campus as per users due to lack of accessibility to public transportation.	Users feel campuses to be accessible to public transportation and in city Centre. Users not comfortable having scattered buildings	Site for new campuses to be chosen in City center/ connected to an unisolated town or village with all accessible public utilities for users. Work with local communities for the placement of campus to reduce crime.
TERRITORIAL REINFORCEMENT	Transition of zones i.e. Public, private, semi- private and private spaces for enhancing security. It sends a message of ownership. Example: Vegetation, fencing, decorative elements, water features, signage etc.	Easy for an offender to disappear. Lack of proper way finding	Way finding not easy. Entry of dogs harming users	Site level zoning needs to be done along with way finding. Boundaries to be constructed of strong materials like wrought iron or combination of solid wall with fence on top to reduce outsider's entry.
NATURAL SURVEILLANCE	People can see what others are doing, thereby minimizing the would-be offenders from committing crime. Examples: Security grilles and doors, Effective lighting and windows, street designing, Proper landscaping, CCTV monitoring etc. Buildings with U, O and H profiles result in courtyards protected on three or four sides. Hidden alcoves or entrances, serves as concealed areas for criminal activity. To improve visibility, chamfered corners are to be adopted. Administration areas need to have clear line of sight of playground, parking and roads. Pedestrian pathways, laneways, and access routes should be lit adhered to the national lighting code (SP72: 2010) for adequate exterior illumination levels. Plants with low hedges and high canopied trees with clean trunks are suitable for natural surveillance.Trees should be trimmed upto 2.4m and shrubs not more than 600-750mm in height.Trees to be away from the building line. Street furniture should be away from building edges. Playgrounds or car parking, or any open spaces should have natural surveillance from building windows. Elevators or stairwells are to be provided with open style or transparent over doors or walls. . If entrapment spots are unavoidable, need to be well lit or closed after hours. Avoid seating near atms, phone boxes, toilets, corridors, and isolated locations.	Trees /bushes obscure lighting, Difficulty in identifying face above 25m distance, unsafe parking areas, lack of safety at staircase. Low monitoring of users of street activity, blind spots.	Blind spots, lack of safety in campus, , on street activities cannot be monitored from windows. , intrusion of outsiders inspite of security at entrances	Building geometry to be O,U or H shaped and make sure the orientation of building geometry promotes natural surveillance. Windows needs to be designed in such a manner that street activities and parking spaces are visually accessible. Blind spots to be avoided through building geometry and entrapment spots under staircases needs to be covered. Hidden alcoves or any entrances designed with recessed entry needs to be chamfered at corners. Playgrounds needs to be accessible from all sides of the building or at least the administration areas. Administration areas need to be planned at the perimeter of building. Trees trimmed till height 2.4m and shrubs not more than 600-750mm in height needs to be chosen and to be planned away from the building line. Street lighting level of at least 5 lux needs to be maintained as per SP7:2010 code.

| CPTED PRINCIPLES	Literature study	GITAM UNIVERSITY	OSMANIA UNIVERSITY	RECOMMENDATIONS/FINDINGS
ACCESS CONTROL	Helps in denying targeted access. Examples: Bollards, fencing designing, Alarm systems, gates, etc. A.) Entrances should be at prominent positions b.) Proper directional signage to be provided c.) Minimize the number of entry points and provide higher security checks d.)Natural surveillance must be provided from streets e.) Avoid blank walls fronting streets f.) Offices should be planned to face the street activities g.)Security through RFID Card access into entries post working hours. Front fences should not be higher than 1.2m.All entrapment points to be avoided such as blind corners, under stairs, wide columns etc. Adequate lighting and mirrors to be provided where design features are unavoidable	Less functioning of security systems	Less functioning of security systems	Way finding to be made easier through planning.Number of entry points to be minimized to not more than 4 depending upon the scale of the site and accessibility.Zoning to be done properly based on public, semipublic and private zones. Areas not in use after college hours need to be closed either with mesh or any other fencing to restrict users access.
MANTENANCE	A well-maintained area attracts people and creates a sense of safety and security. Examples: vandal-proof and antiskid materials, Street lighting, Remove graffiti ,etc.	Higher chances of vandalism	Graffiti observed in few areas i.e., hostels	Graffiti needs to be reduced and green walls can be proposed to avoid graffiti and thereby aesthetically appears pleasing.
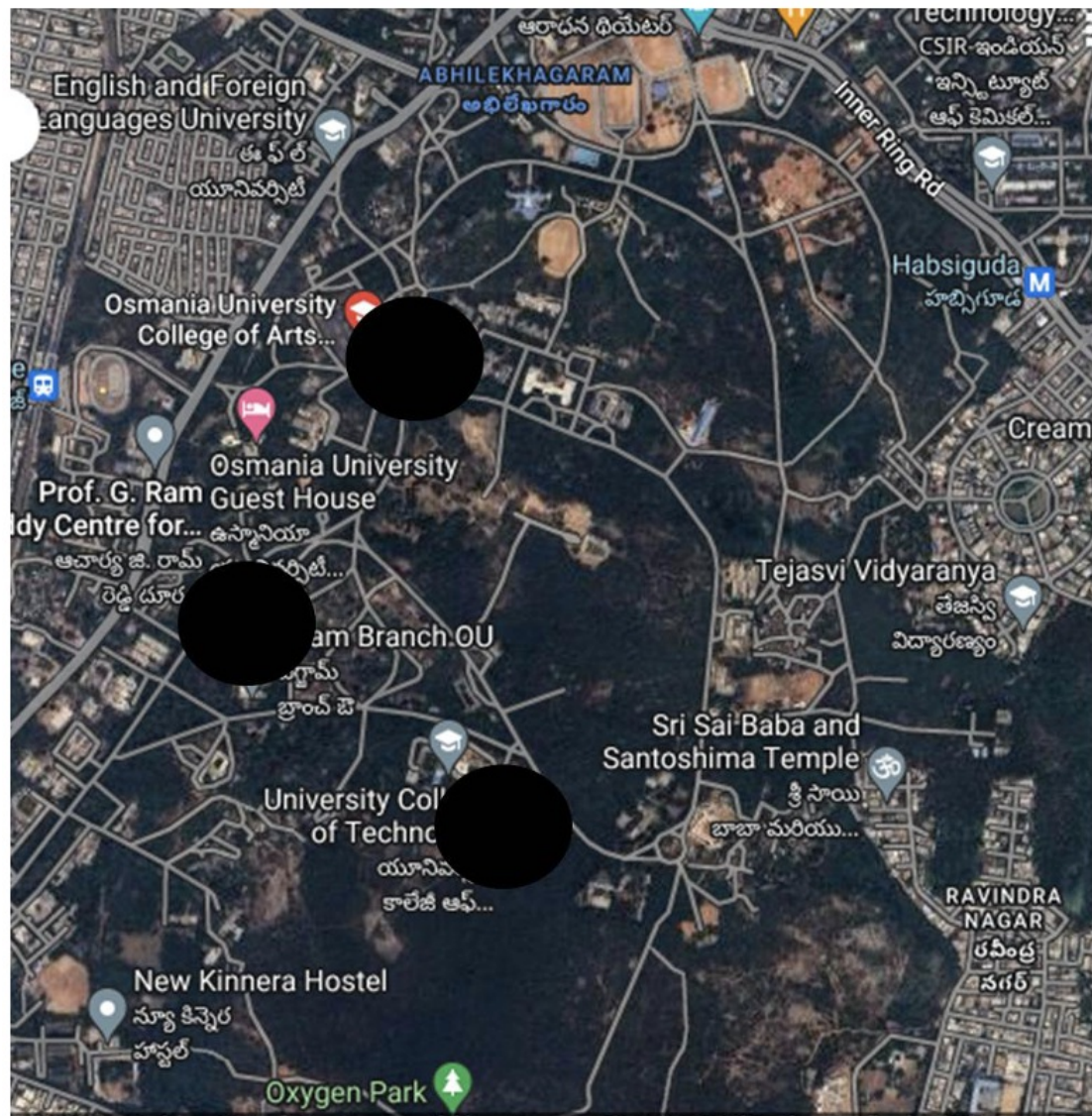
Figure 29. Image depicting blind spots at Osmania University (Source: Author)
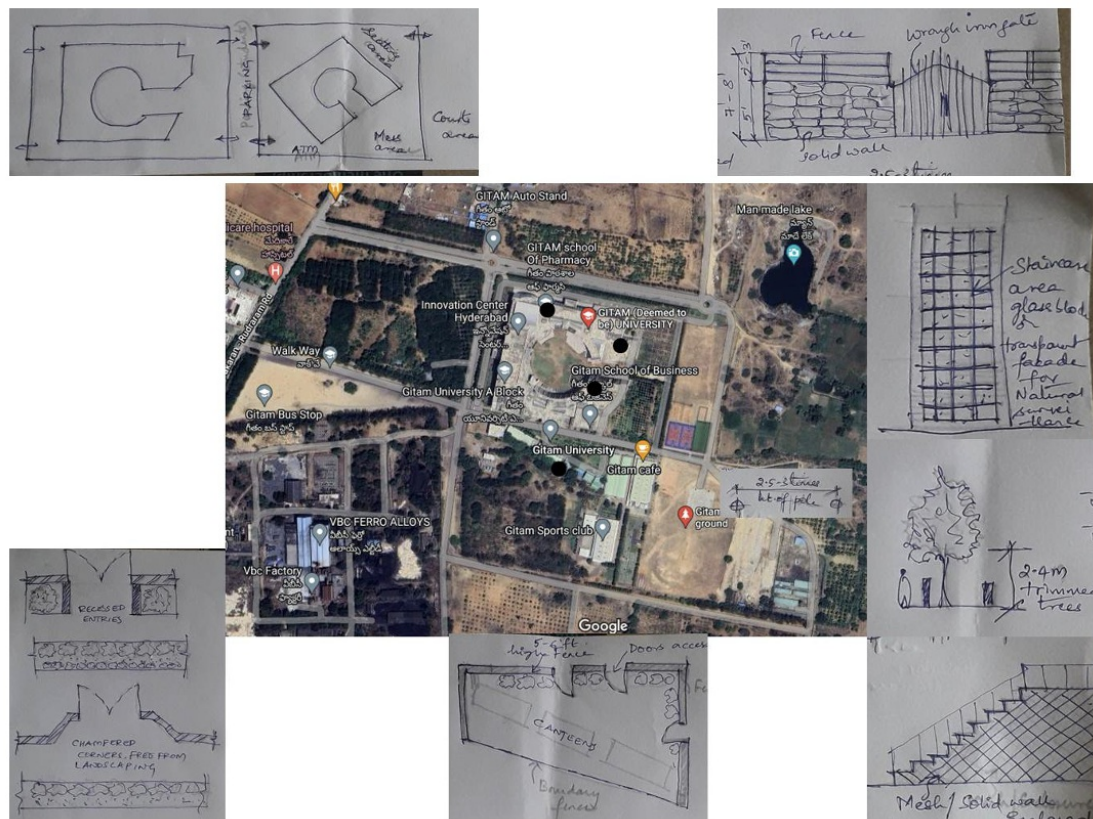
Figure 30. Image depicting design solutions at GITAM Campus for CPTED measures (Source: Author)

4. Discussion

To obtain an exterior safe campus model following are the changes that needs to be adopted: Site for new campuses to be chosen in City center/ connected to an unisolated town or village with all accessible public utilities for users. Work with local communities for the placement of campus to reduce crime. site level zoning needs to be done along with way finding. Boundaries to be constructed of strong materials like wrought iron or combination of solid wall with fence on top to reduce outsider's entry. Building geometry to be O, U or H shaped and make sure the orientation of building geometry promotes natural surveillance. Windows needs to be designed in such a manner that street activities and parking spaces are visually accessible. Blind spots to be avoided through building geometry and entrapment spots under staircases needs to be covered. Hidden alcoves or any entrances designed with recessed entry needs to be chamfered at corners. Playgrounds need to be accessible from all sides of the building or at least the administration areas. Administration areas need to be planned at the perimeter of building. Trees trimmed till height 2.4m and shrubs not more than 600-750mm in height needs to be chosen and to be planned away from the building line. Street lighting level of at least 5 lux needs to be maintained as per SP7:2010 code. Way finding to be made easier through planning. Number of entry points to be minimized to not more than 4 depending upon the scale of the site and accessibility. Zoning to be done properly based on public, semipublic and private zones. Areas not in use after college hours need to be closed either with mesh or any other fencing to restrict users access. Graffiti needs to be reduced and green walls can be proposed to avoid graffiti and thereby aesthetically appears pleasing. Above mentioned are CPTED recommendations for future campus planning model. The

above mentioned optimum strategies are for a safe exterior campus model. The scope for future research is a detailed interiors study and mechanical systems of campuses such as Lobbies, reception areas, staircases, ramps, administrative areas, corridors, toilets, hvac, fire control, surveillance systems, elevators.

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