



Improving the quality of life

# MAN-MADE HAZARDS: EXPLOSIVE AND FLAMMABLE HAZARDS

OHIO COMMUNITY DEVELOPMENT CONFERENCE

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NOVEMBER 20, 2014

## EXPLOSIVE AND FLAMMABLE HAZARDS



- HUD regulates the siting of HUD-assisted projects near explosive and flammable hazards, and the siting of explosive and flammable hazards at HUD-assisted projects, at [24 CFR 51 Subpart C](#)

## EXPLOSIVE AND FLAMMABLE HAZARDS



- “HUD-assisted projects” include:
  - > Development, construction, rehabilitation, modernization or conversion
  - > With HUD subsidy, grant assistance, loan, loan guarantee or mortgage insurance
  - > Residential, institutional, recreational, commercial or industrial use

## EXPLOSIVE AND FLAMMABLE HAZARDS



- “HUD-assisted projects” include rehabilitation and modernization **only** if these projects expose more people to the hazard by:
  - > Increasing residential densities
  - > Converting building use to habitation
  - > Making a vacant building habitable

## EXPLOSIVE AND FLAMMABLE HAZARDS



- A **hazard** is an aboveground stationary container storing any quantity of hazardous liquids or gases, or storing more than 100 gallons of common liquid industrial fuels (e.g. gasoline, kerosene, fuel oil, crude oil)

## EXPLOSIVE AND FLAMMABLE HAZARDS



- These are not hazards:
  - > Underground pipelines, and aboveground pipelines in compliance with Federal, state and local safety standards
  - > Containers of 100 gallons or less storing common liquid industrial fuels
  - > Natural gas holders with floating tops
  - > Mobile conveyances (tanker trucks, barges, etc.)

## EXPLOSIVE AND FLAMMABLE HAZARDS



- Two types of hazards are evaluated
  - > Thermal radiation – heat caused by fire
    - Maximum permitted for buildings = 10,000 BTU/ft<sup>2</sup>-hr
    - Maximum permitted for people = 450 BTU/ft<sup>2</sup>-hr
  - > Blast overpressure – force caused by explosion
    - Maximum permitted = 0.5 psi

## EXPLOSIVE AND FLAMMABLE HAZARDS



- **Acceptable Separation Distance (ASD)**
  - > The minimum distance from a hazardous operation to where a HUD-assisted project can be located in accordance with HUD's standards of blast overpressure and thermal radiation. In addition, it is the minimum distance that HUD-assisted projects involving the installation of hazardous facilities can be located from existent or planned residences or from any other facility or area where people may congregate.



## EXPLOSIVE AND FLAMMABLE HAZARDS

- Four-step evaluation process
  1. Identify hazards
  2. Calculate ASDs using appropriate standards
  3. Determine whether the project site meets the standards
  4. If not, mitigation may be required



## EXPLOSIVE AND FLAMMABLE HAZARDS

- Identifying hazards: Start with a 1-mile radius from site
  - > Aerials, windshield survey, photos of and from site
  - > Identify and map all aboveground storage containers
  - > Identify for each container:
    - Contents (chemical) and capacity
    - Diked vs. undiked; if diked, dimensions of diked area
    - Pressurized vs. non-pressurized
    - If pressurized, does it hold a cryogenic liquefied gas?



## EXPLOSIVE AND FLAMMABLE HAZARDS



- Assistance in identifying contents/capacity:
  - > Tank labels, dimensions
  - > Tank facility personnel
  - > Local fire department
  - > Local emergency response committee

## EXPLOSIVE AND FLAMMABLE HAZARDS



### ◉ Calculating ASDs

- > Know which ASDs will be applicable.
  - ASD for thermal radiation (buildings) and ASD for thermal radiation (people) both apply to all tanks
    - Diked vs. undiked changes fire width and thus changes ASD
  - ASD for blast overpressure applies only to pressurized tanks that do not hold cryogenic liquefied gas
    - Diked vs. undiked does not matter for this ASD

## EXPLOSIVE AND FLAMMABLE HAZARDS



- ◉ Worksheets are available for calculations, but easier to use HUD's online ASD Assessment Tool
  - > [http://portal.hud.gov/hudportal/HUD?src=/program\\_offices/comm\\_planning/environment/asdcalculator](http://portal.hud.gov/hudportal/HUD?src=/program_offices/comm_planning/environment/asdcalculator)

## EXPLOSIVE AND FLAMMABLE HAZARDS



## EXPLOSIVE AND FLAMMABLE HAZARDS



- Multiple tanks and multiple diked areas.
  - > Evaluate the largest undiked tank and the largest diked area
  - > Evaluate the closest undiked tank and the closest area
  - > Evaluate the largest and closest pressurized tanks (remember, not cryogenic liquefied gas tanks) separately
- In this example, all tanks were diked and were not pressurized– evaluate the largest and the closest diked areas

## EXPLOSIVE AND FLAMMABLE HAZARDS



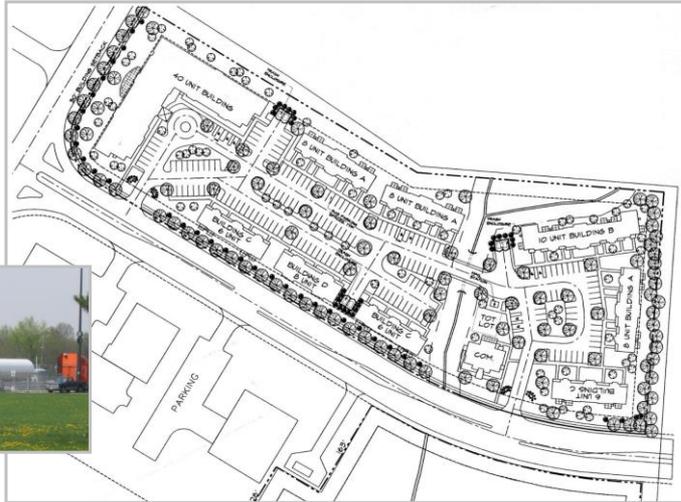
- Largest diked area, measured at top of dike, is approximately 260 ft x 340 ft = 88,400 ft<sup>2</sup>
- Closest diked area is irregular, but approximately 200 ft x 290 ft = 58,000 ft<sup>2</sup>
- Note: tanks in this example held between 15,000 and 80,000 bbls, or 630,000 to 3.34 million gallons

## EXPLOSIVE AND FLAMMABLE HAZARDS



- Largest diked area:
  - > ASD, thermal radiation (people) = 1,007.20 feet
  - > ASD, thermal radiation (buildings) = 210.32 feet
- Closest diked area:
  - > ASD, thermal radiation (people) = 844.53 feet
  - > ASD, thermal radiation (buildings) = 173.13 feet
- No ASD radius reached the project site – meets standard

## EXPLOSIVE AND FLAMMABLE HAZARDS



## EXPLOSIVE AND FLAMMABLE HAZARDS



- Two tanks, both containing propane gas
- Under pressure
- 27,000 gallons each

## EXPLOSIVE AND FLAMMABLE HAZARDS



- Since both tanks are the same size and type, calculate only for closest tank:
  - > ASD, blast overpressure = 651.19 feet
  - > ASD, thermal radiation (people) = 1,091.71 feet
  - > ASD, thermal radiation (buildings) = 230.74 feet
- Project site meets standard for ASD, thermal radiation (buildings) but fails the remaining two standards

## EXPLOSIVE AND FLAMMABLE HAZARDS



# 8 10:54:28 2005

1631' x 1200'  
(1" = 300')

## EXPLOSIVE AND FLAMMABLE HAZARDS



- Where is the ASD, thermal radiation (people) applied?
  - > Outdoor gathering spaces
    - Playgrounds
    - Recreation areas
    - Balconies and patios
    - Residential parking lots (not commercial, etc.)

## EXPLOSIVE AND FLAMMABLE HAZARDS



- Mitigation is required if the standard is not met
  - > First, evaluate existing natural and man-made barriers: is there a line of sight between the project and the tanks? If not, evaluate the intervening structure to determine whether it will abate the hazard
    - Analysis must be performed by a licensed professional engineer (structural and some civil engineers will have the necessary knowledge)

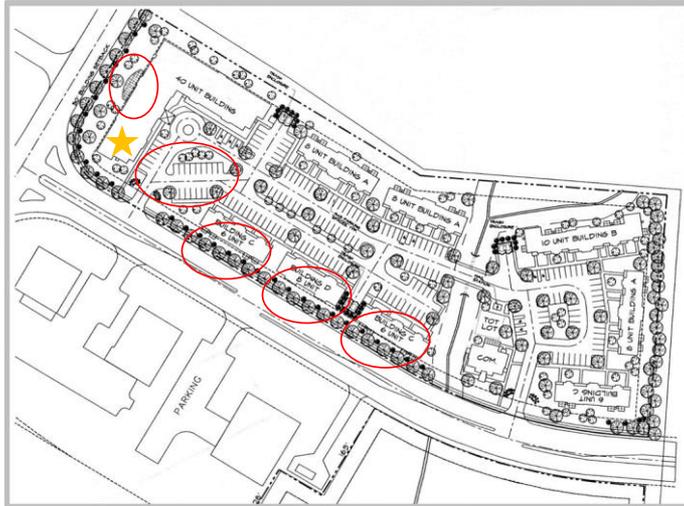
## EXPLOSIVE AND FLAMMABLE HAZARDS



## EXPLOSIVE AND FLAMMABLE HAZARDS



- Next, consider approaching the tank owners for a solution
  - > Bury the tanks or place them below grade?
  - > Construct a blast wall adjacent to the tanks?
- If that is not feasible, consider project site design
  - > Move sensitive uses further away (or choose a different site)
  - > Rework site and building design to provide appropriate protection
  - > Construct barrier at the project site – last resort!



- Areas at risk – what could be done?



## EXPLOSIVE AND FLAMMABLE HAZARDS



## EXPLOSIVE AND FLAMMABLE HAZARDS



- Assistance is available from HUD if the project requires barrier analysis or the identified tanks store materials not listed in the HUD guidebook
  - > Contact your area Environmental Contact – Ross Carlson
    - [Ross.Carlson@hud.gov](mailto:Ross.Carlson@hud.gov) or (614) 469-5737 ext. 8252
  - > Contact Nelson Rivera at HUD Washington
    - [Nelson.A.Rivera@hud.gov](mailto:Nelson.A.Rivera@hud.gov)



◦ Questions?