

BANGLADESH GARMENTS INDUSTRY – NECESSITY FOR CODE COMPLIANCE

Preamble

Recently, Bangladesh Garments Industry had suffered severe setback as thousands of people were charred and killed due to fires in buildings or building collapse. The fires and collapse of buildings were mostly due to violation of codes or insufficient design and lack of quality control during construction. While Bangladesh developed its own building codes in 1995 via a code committee consisting of government officials, consulting engineers and university professors, the codes, in reality this code had never been implemented. Besides, as the technology had been changing and factories or industries are utilizing modern methods and the owners focus on maximize use of space to maximize their production, there are inherent lag in adopting codes that were developed. In this regard, few members of **the American Association of Bangladeshi Engineers and Architects (AABEA)** who are associated with building and construction industry in the USA had met and developed the following outline of the immediate steps to be taken to initiate compliance of the industry to minimize loss of life and property. In next few weeks, these outlines will be amended and new requirements will be added to complete the code requirements. The outline, especially the design and construction requirements are heavily drawn from **International Building Code (IBC) (www.icbo.org)**.

In existing buildings to be used for large numbers of workers, **the Occupational Safety and Health Administration (OSHA) (www.osha.gov)** provides guidelines for safety and health of individual workers. In fact **OSHA** admits and empowers each employee to have right for a safe work place and their right to demand to address any and all issues that requires attention. An amicable life insurance policy for each and every employee is needed to address future liability of injured and employees died in accidents. Insurance policies also help to bring additional workplace safety inspection for the sake of Insurance companies' liabilities.

It is explicitly understood that to implement the code outline provided below will be time consuming and expensive. Besides, there might be shortage of trained manpower to implement these codes/ recommendations. As such, first step might be to concentrate on developing the administrative and training of man power portion as outlined in IBC, OSHA and other codes. In this regard, AABEA will be best suited to act as bridge between the regulators over in Bangladesh and the code requirements. As accepted by OSHA, it will be imperatives that during development of the remedial retrofits, representatives from the workers should be included.

This report was developed to address the existing situation of the country immediately. This includes condition assessments of existing garments, identify problems and take necessary steps to mitigate the problem from a holistic view point. It further addresses on retrofitting existing plants for code compliance with minimum expenditure, minimum fire safety codes for new plants; Inspection of plants for operating code compliances, design guidelines for new construction, and construction inspections.

A. Condition Assessments of all existing garment manufacturing plants:

1. All existing garment industries must be inspected by certified code specialists, Engineers, Architects, and Mechanical, Electrical and Plumbing Engineers;
2. No factory can be operated in any building which was built without any building permit;
3. For buildings built with appropriate permits, and if engineers finds that the building is capable of operating the existing garment factory to continue the plant it will be necessary to secure an undertaking from the building owner that the building was built as per specifications as shown in permit drawings;
4. If the building is found built without any building permit, or additional stories were built, which were not shown on the permit drawings and/or if the inspecting authority finds that the facility was not built meeting all specifications; and or facility is risky to carry on the existing operation, the inspecting authority will issue a “Condemnation Letter” for specified use and issue it to the owner with copies to Fire Department, Police Department, BGMA, Ministry of Industry, and utility companies;
5. Upon receipt of such “Condemnation Letter” all utility companies will disconnect all their utility connections and building must be vacated by the garment plant;
6. These types of buildings can be used for other purposes if specified by the inspecting authority.

B. Retrofit of all Existing Certified Buildings for Garment Factory & Compliance:

1. All buildings fit for occupying by the garment plant, the regulatory authority will issue a Certificate of Occupancy (CoO). A copy of the CoO issued by the regulatory agency should be posted in the main lobby and on each floor prominently; One copy should be with the Building Manager’s file;
2. The CoO will contain at a minimum, name of the owner, address, type of structure and intended use, occupancy capacity at a minimum. Utility companies will verify such certificates for continuation of their service to the building;
3. A file containing CoO, design details (load bearing capacities on various part of the building), an as-built drawings, updated use plan, if any; an emergency evacuation plan of the facility should be given to the Fire Department, which will be kept in digital format with this emergency responding agency so that they can use it during evacuation/rescue operation;
4. All flammable materials including cloths and readymade garments before shipments must be secured in fire contained rooms, built with fire retardant materials with metallic doors, so that if fire happens in these areas can be contained for several hours and workers can be escaped safely. These storage areas cannot be build near the fire escape routes;
5. All escape routes should be stripped with self illuminating materials during the dark and smoke, so that workers can escape safely in any adverse situation;

6. Emergency evacuation plan must be installed in all corridors with a distance not to exceed 50 feet;
7. All corridors, work areas and stairs case must be equipped with adequate numbers of emergency lighting; firefighting equipment and fire suppression cylinders;
8. Every floor must have additional metallic escape stairs for emergency evacuation. The access and landing areas of such escape stairs must be kept free from any type of obstructions for all times;
9. Window screens installed by garment owners to protect pilferage some of those should be build with wire mesh (mosquito screen type) and easy to break during the emergency;
10. Building must have deep tube well fire pumps or gravity flow reservoir system with a minimum capacity of 15000 gallon capacity. Where the gravity flow reservoir is not possible in that case the reservoir should be equipped with motorized pumps and fed by emergency generator;
11. Building must be equipped with fire hydrant and fire hose system installed on every floor, connected with the deep tube well or reservoir so that the fire fighting unit of the building can handle the emergency before the Fire Service unit arrives at the scene;
12. No occupied garment factory can be kept under lock and key collapsible gates, they must me manned all the time;
13. Each plant must have trained persons to handle the emergency evacuation system. They will be trained and certified by Fire Department, so that they can handle the emergency before Fire Service unit arrives at the scene;
14. The owner of the plant must conduct fire drills randomly to educate occupants about evacuation during any emergency;

C. Minimum Fire Emergency Standards for new Garment Factory

1. All commercial and multi storied buildings cannot be build without proper building permits (including foundation, structural, mechanical/electrical/plumbing and fire alarm). The regulatory authority will save guard all applications, drawings and permit digitally, so that those can be reproduced any time in the future. It will also be the responsibility of the owner to secure both building and all trade permits before they start construction;
2. No utility connection will be provided by utility companies for any such facilities unless they have copy of Certificate of Occupancy (CoO) issued by the regulatory agencies. The CoO will contain at a minimum, name of the owner, address, type of structure and intended use, occupancy capacity at a minimum. Utility companies will verify such certificates from the regulatory agencies before approval for such connections;
3. A copy of the CoO should be posted in the main lobby and on each floor prominently;
4. All building permits and CoO must be saved in the digital form to save guard such vital documents by the issuing authorities;

5. For any building where more than 50 people will live, assemble, and or work at a single time must have access through a wide road and water hydrants so that Fire Engine can reach and maneuver when it will be required;
6. A file containing CoO, design details (load bearing capacities on various part of the building), an as-built drawings, updated use plan, if any; an emergency evacuation plan of the facility should be given to the Fire Department, which will be kept in digital format with this emergency responding agency so that they can use it during evacuation/rescue operation;
7. If the building is designed and or used to store high hazard materials, a copy of the manifest must be with the local Fire Department and nearest Post Offices or any local government agency;
8. All flammable materials including cloths and readymade garments before shipments must be secured in a fire contained rooms, built with fire retardant materials with metallic doors, so that if fire happens in these areas can be contained for several hours and workers can be escaped safely. This area must be equipped with fire sprinkler system. These storage areas cannot be build near the fire escape routes;
9. All escape routes should be stripped with self illuminating materials during the dark and smoke, so that workers can escape safely in any adverse situation;
10. Emergency evacuation plan must be installed in all corridors with a distance not to exceed 50 feet;
11. All corridors; work areas must be equipped with adequate numbers of firefighting equipment and fire suppression cylinders;
12. Building must be equipped with fire sprinkler system;
13. Building must have deep tube well fire pumps or gravity flow reservoir system with a minimum capacity of 15000 gallon capacity;
14. Building must be equipped with fire hydrant and fire hose system installed on every floor, connected with the deep tube well or reservoir so that the fire fighting unit of the building can handle the emergency before the Fire Services unit arrive at the scene;
15. Based on the occupancy, the corridors and stairs must be built as per standard codified in the International Building Codes (IBC);
16. Every floor must have additional metallic escape stairs for emergency evacuation. Access to and the landing areas of the emergency escape stairs must be kept free from any type of obstructions for all times;
17. Window screens installed by garment owners to protect pilferage some of those should be build with wire mesh (mosquito screen type) and easy to break during the emergency.
18. No occupied garment factory can be keep under lock and key collapsible gates, they must me manned all the time;

19. Each plant must have trained persons to handle the emergency evacuation system. They will be trained and certified by Fire Department, so that they can handle the emergency before Fire Service unit arrives at the scene;
20. The owner of the plant must conduct fire drills randomly to educate occupants about evacuation during any emergency;
21. The renter or factory owner must have a copy of all relevant documents and verify if the facility can be used to operate their plants. They have to understand the building use, design and restricted covenant prior to set up of the factory.

D. Garment Factory Inspection System for Fire Emergency

1. Every 6 months or more frequently the plant must be inspected by the Fire Department personnel for their compliance;
2. Fire Department at a minimum will inspect the facility based on their protocols and issue inspection reports;
3. If any deficiencies identified will be given notices to rectify those immediately and may impose penalty for non-compliances.

E. Design Code for Building New Garment Factory

1. All buildings that would be designed for Garment Factories shall be classified as Occupancy Class described in **Chapter 3 and 4** of the International Building Code. As these factories store flammable cloths and yarns, they may be classified as **High Hazard Group H** rather than Factory Group F. As such, this may put limits on number of occupants at a time with safe passageways for fires or other emergencies to exit within a certain time frame. This will minimize fatalities in case of emergencies;
2. Live load design should be categorized as Heavy Manufacturing as recommended in **Table 1607.1** of International Building Codes with a minimum live load of 250 pounds per square foot and a concentrated load of 3000 pounds. The load combinations for floors shall be analyzed by structural engineer to optimize the design;
3. Any overhead roof water reservoir or other equipment (such as Electrical Generators) storage areas shall be designed appropriately by a structural engineer with sufficient knowledge and experience and with reputation among the engineering community;
4. All construction should be certified by the designer. The concrete mix, testing, and inspection of reinforcements should meet the design requirements and the engineer of record should be the one that certify the materials;
5. An occupancy certificate should be available at all entry to the building and design report should be at the facility file and at the office of the appropriate regulatory office. The fire service office should keep a copy of as-built drawing and updated use-plan in case they can use it during evacuation/rescue.

6. The renter or factory owner must state that he/they had the understanding of the building use, design and restricted covenant prior to set up of the factory.
7. All framed structural buildings shall be designed by structural engineer who have experiences of designing and optimizing the designing of buildings including lateral analysis and stability analysis of the buildings under wind, seismic or other transient loads.
8. All buildings must have a geotechnical exploration completed with sufficient borings, field and laboratory testing, and a report with recommended foundation design criteria such as bearing pressure, settlements, pile load capacity, seismic site classifications, site specific response spectra for zero, 0.2 and 1.0 second periods. This will help the structural engineer to optimize the seismic load and load due to vibrations. Some skinny, ductile but tall structures may undergo cyclic loading during wind that create so-called vortex shedding, may govern the design instead of earthquake and these should be accurately analyzed considered in the design.
9. If the site use cone penetration test, the cone penetration should utilize pore water measurement and its dissipation criteria so that geotechnical engineer can develop proper criteria for settlement and bearing capacity analysis. Standard penetration tests should be done in appropriate manner using **American Society for Testing and Materials (ASTM) standard or equivalent British or Australian standards**. These are not expensive.
10. Concrete mix design should be developed by the structural engineer and instead of brick khoa, stone aggregate should be used for high rise framed structures. Fine aggregates in concrete should be sand with water absorption of less than two percent to make sure the sand are made of durable minerals.
11. No recommendations will work unless there is a good inspection. Buildings and factory owners including designer, inspectors shall carry liability insurance extending to the life of the building except the insurances from the designer and construction inspectors. Liability insurance from designer, contractors, and construction inspectors shall extend at least 10 years. No building should be occupied without liability insurance. The insurance company also inspect to reduce their risk associated with working environment, sufficiency of building design, fire escape and other emergency requirements.
12. AABEA will be able to put together a team of expert to develop the training curriculum for inspection and testing of concrete in the field and in laboratory and can properly certify those individuals. AABEA will be able to donate manuals and will be able to assist in setting up laboratory for testing and inspection in each municipalities and jurisdiction. They can perform the testing/inspection and fees should be collected during building permit as that is done in USA by the cities development service departments.

F. Construction Inspection Services

It is true that the regulatory agencies do not have enough manpower for inspection during the construction. And without proper inspection it is difficult to maintain the quality of any structure.

To maintain the quality of the construction as per designed specifications and without increasing the expenditures of the public agencies the following options are recommended:

1. The government can use 3rd party inspection systems as supplement to their services. The third party inspectors shall be certified and work under qualified and experience engineers. The regulatory agency can train local Architectural/Engineering companies for proper inspections and to issue certificates to them and authorize them as 3rd party inspectors. The regulatory agencies will assess and collect a reasonable fee for such facilities from these companies/individuals.
2. The 3rd party inspectors will inspect the constructions based on design and specifications and will safeguard all inspection reports in digital formats. The final inspection reports will be submitted to the regulatory agency for issuance of the CoO, once the construction is satisfactorily completed. These inspectors will assess and collect a reasonable fee from the building owners;
3. All construction should be certified by the designer based on inspection protocols. The concrete mix, testing, and inspection of reinforcements should meet the design requirements and the engineer of record should be the one that certify the materials;
4. Bangladesh Testing Institute or Technical Educational Institutions will randomly test all electrical cables, reinforced steels, cements, and other major building materials available in the market for quality certifications. These institutions can assess and collect a nominal fee from the manufacturers. These institutes must safeguard the test protocol and test results in digital format;
5. All 3rd party inspection companies must carry liability insurance to coverage;
6. This certifications will be renewable every year, and the regulatory agencies will keep records of these vendors with the performance reports;
7. Before the CoO is issued for the facilities the regulatory agencies will inspect the facilities;
8. American Association of Bangladeshi Engineers and Architects will participate to develop the inspection protocols following the IBCs, if request comes.