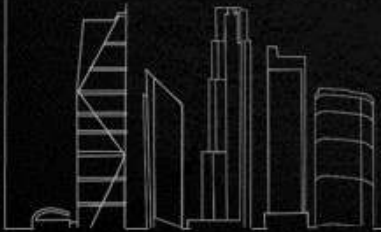# PHILIPPINES MECHANICAL CONNECTION REQUIREMENTS

SYSQUARED + ASSOCIATES

MECHANICAL CONNECTION

- Reinforced concrete structures are designed to behave monolithically and transmit forces through the structure in a continuous manner. To achieve continuity of load path, **Mechanical Connection** may be used to connect reinforcing bars.

Advantages of Mechanical Connection

- Congestion Mitigation

- Cost effective for larger diameter bars (32mmØ and larger).

- Improve structural integrity

- Mitigate Formwork Damages

- Jobsite Safety

Congestion Mitigation

- No overlapping of reinforcement.
- Reduces the total amount of reinforcement.

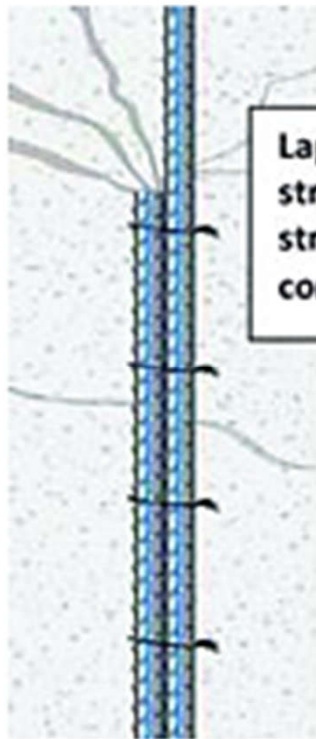Congestion due to lap splicing

Reinforcement with Mechanical Splicing

Cost effective for larger diameter bars

- The lap length is proportional to the bar diameter. Therefore, as the bar diameter increases, overlapping steel also increases leading to a huge wastage of steel.

Simple Lap Splice   Welded Lap Splice   Mechanical Splice

Improve Structural Integrity

Lap splices depend on concrete for strength, and therefore lack structural integrity and continuity in concrete construction.

Mechanical splicing provides the assurance of maintaining load-path continuity of the structural reinforcement, independent of the condition or existence of the concrete.

Mitigate Formwork Damage
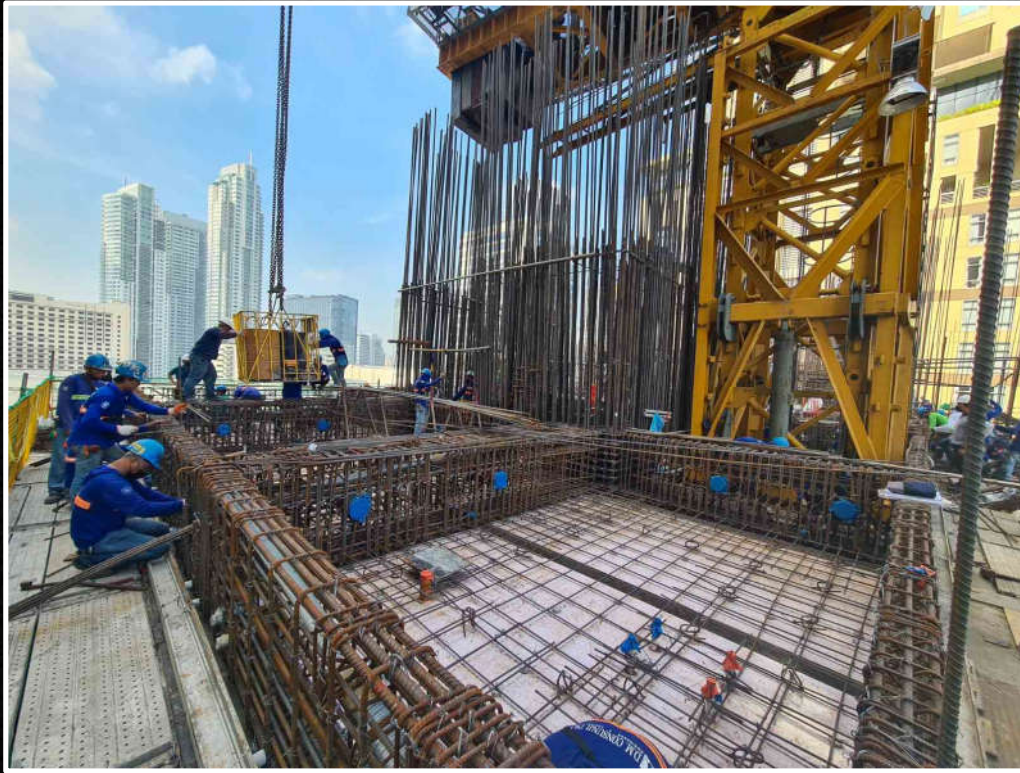
- Drilling of forms for dowels
- Removing of forms can be difficult and time consuming.

Prevent Slip Form System
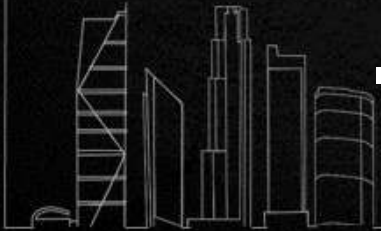

■ Slip form casting cannot be applied due to beam rebar installation.

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JOBSITE SAFETY

- Damage Dowels due to onsite Equipment.
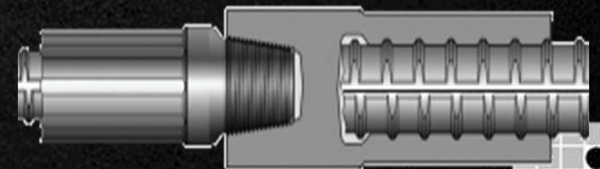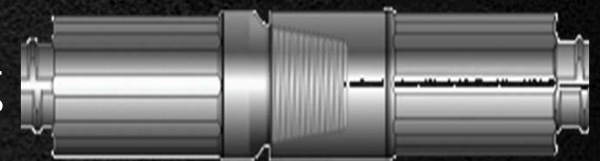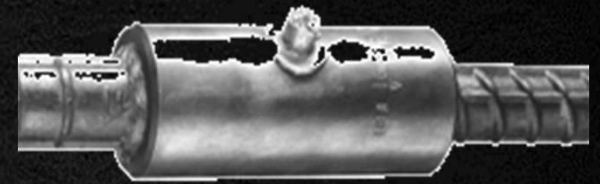
MECHANICAL CONNECTION

Design Requirements for Mechanical Splices ACI 318

Type 1 Mechanical Splice

- Type I Mechanical splice should develop in Tension or compression a minimum of $1.25fy$ of rebar strength.

Type 2 Mechanical Splice

- Type II Mechanical splice are required to develop the specified minimum tensile strength of the bars being spliced.
  - 550 MPa and 1.25fy - ASTM A 706 /A 706M
  - 620 MPa - ASTM A 615 /A 615M Grade 60
  - 420 MPa – ASTM A 615 /A 615M Grade 40.

Summary of Restrictions of QT/TMT Reinforcing Bars in Building Construction

1. Welding is not allowed

2. Hot bending or heating beyond 275°C is not allowed

3. Galvanizing is not allowed

4. Rebending or straightening is not allowed

5. Threading of bars for mechanical couplers is not allowed

MECHANICAL CONNECTION

DPWH DO No. 113
ITEM 737

Material Requirement

All mechanical couplers shall be designed to be uniaxial and shall be one of the following types or a combination of any of the following:

- Sleeve-filler – commonly used for compression only. Primarily used for precast construction

- Sleeve threaded - designed for worldwide standard grades of rebar. Excellent for future extension application

- Sleeve swaged – used for joining reinforcing bars to structural steel members. Suitable to both tension and compression application

- Sleeve bolted – Provide cost effective method of joining reinforcing bars, particularly when the fixed bar is already in place and there is insufficient space for a hydraulic swaging press

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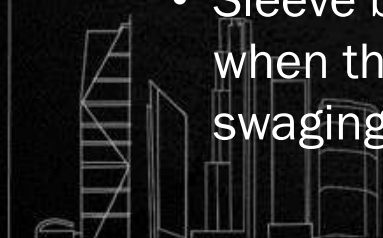
MECHANICAL CONNECTION

DPWH DO No. 113
ITEM 737

Sampling Requirement

- Mill Certificate attached with test result of product.

- 1 lot = 4 coupler (each type, model, bar size and grade), Sample lot in every 500 coupler or a fraction thereof.
    - 2 Samples for Slip and Tensile test
    - 2 samples for fatigue

- 25mmΦ and smaller with minimum sample length 1.5 meter

- 28mmΦ and larger, sample length must be at least 2 meter

- Coupler length must be less than 10 times the nominal bar diameter
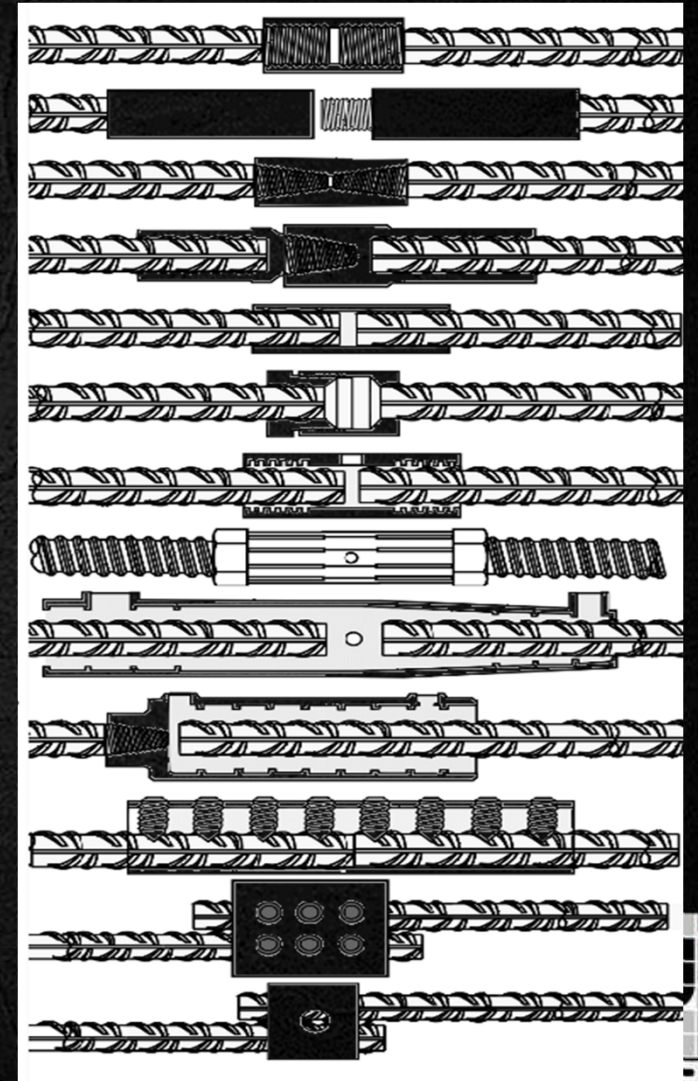
DPWH DO No. 113
ITEM 737

Types of Mechanical Testing

1. **Slip Test Criteria**
   - Average slip must not exceed 0.25mm for bars with 25mm Ø and smaller; and 0.75mm above 25mmØ reinforce bar.

2. **Fatigue Loading (ASTM E466 and E606M)**
   - 80,000 cycles at a maximum of five (5) cycles per second.
   - Maximum frequency may vary depending on the limits set in ASTM E466
   - Coupler shall, at least, develop a yield strength of 125% with the spliced connecting bars
   - Tensile tests shall be in accordance with ASTM A370

THANK YOU!